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# THE WATER CYCLE STRATEGY PROCESS AND ITS APPLICATION: An Exploratory study of the process in Milton Keynes

School of Applied Sciences

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# THE WATER CYCLE STRATEGY PROCESS AND ITS APPLICATION: An Exploratory study of the process in Milton Keynes

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# Abstract

Water Cycle Strategies (WCS) have been developed for various areas of the UK. WCSs gather an evidence base which should assist with the promotion of sustainable water management and compliance with important legislation such as the Water Framework Directive (WFD). WCSs also provide evidence which influences the development of local spatial planning policy.

This research explored the WCS process undertaken for Milton Keynes (England). The intention of this research was to critically assess the WCS process and its current relevance to sustainable water management, namely WFD compliance. In order to critically assess the WCS process, and to assess its potential and implications for the future of sustainable water management within spatial planning, this research was conducted in three stages and included several organisations, both regulators and regulated.

The WCS process is new in spatial planning in England and is rapidly evolving due to several factors identified by this thesis, such as reforming of the spatial planning process or compliance with the WFD. The WCS process affects the influence of different stakeholders, social learning, inter-sectoral joined-up work, and the need for catchment specific evidence base. These aspects influence the outcomes of the WCS process locally, and should also aid implementation of sustainable water management in growth areas regionally and nationally.

This study has indentified and analysed the influence of the WCS process so as to critically assess and discuss it. The thesis provides the reader with an insight into how sustainable water management, namely WFD compliance, may be realised in integrated spatial planning in the case of urban growth areas in England.

# Acknowledgements

This thesis took me to some interesting places, exploring interesting things, meeting interesting people. I am grateful to all those who helped to make it happen.

Especially I am grateful to Dr. Matthew Cook, Prof Sue White and Prof Marina Pintar, supervisors who believed in me and supported me throughout the project. You are great!

Za atka in mamico, ki ju imam neizmerno rada.

Juliju.

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| | |
|---|---|
| **AMP** | Asset Management Plan |
| **ARBD** | Anglian River Basin District |
| **ARBDLP** | Anglian River Basin District Liaison Panel |
| **WC** | Water company |
| **CAMS** | Catchment Abstraction Management Strategies |
| **CO** | Consultant |
| **EA** | Environment Agency |
| **EU** | European Union |
| **IDB** | Internal Drainage Board (Bedford Group) |
| **LDF** | Local Development Framework |
| **LDS** | Local Development Strategy |
| **MK** | Milton Keynes |
| **MK WCS** | Milton Keynes Water Cycle Strategy |
| **MKC** | Milton Keynes Council |
| **MKP** | Milton Keynes Partnership |
| **MKPT** | Milton Keynes Parks Trust |
| **RAM** | Resource Assessment Management Frameworks |
| **RBD** | River Basin District |
| **RBMP** | River basin Management Plan |
| **RSS** | Regional Spatial Strategy |
| **SSSI** | Sites of Special Scientific Interest |
| **SUDS** | Sustainable Urban Drainage Systems |
| **UK** | United Kingdom |
| **UN** | United Nations |
| **WC** | Water Company |
| **WFD** | Water Framework Directive |
| **WSI** | Water Services Infrastructure |
| **WSIGr** | Water Services Infrastructure Group |
| **WSIGu** | Water Services Infrastructure Guide |
| **WTW** | Water Treatment Works |

# Chapter 1: Introduction

*This chapter introduces the thesis research. In the first part the background to the research and the thesis context is given. The aims and objectives of the thesis are stated and details of the thesis structure are given in the second part.*

## 1.1 Background to the research and context

The European Union (EU) has had a major impact on British environmental policy through its directives (Cullingworth and Nadin, 2002). Institutionalised water management policies in England cover numerous water issues. Unlike to existing legislation, which separately covers different objectives for protecting the water environment, the WFD (Directive 2000/60/EC) integrates these different issues and aims to maintain ecological services while considering both water quality and quantity. The WFD connects different water legislation and directives into one, based on river basin planning and is changing spatial planning priorities across Europe (Howe and White, 2002). Published in December 2000 and transposed to English and Welsh law in December 2003, the WFD aims for "good status" in waters, and similarly to The Planning and Compulsory Purchase Act (2004), requires evidence based planning. It applies to surface water bodies, including lakes, streams, rivers, estuaries and coastal waters out to one mile from the coast, to groundwater and to artificial waters such as canals (Chave, 2001). However it is estimated that the majority (95 %) of water bodies in the UK will not reach good status within the predefined time constraints (Environment Agency, 2006).

Compliance with the WFD in England aims to be achieved through various levels, including local spatial development plans and strategies, which guide the development of the built environment. Local Planning Authorities (LPA) are currently undertaking considerable work on strategic spatial planning due to growing demand for housing, and regional spatial strategies. For example within the Great Ouse catchment (Anglian River

Basin District), where the growing city of Milton Keynes (MK), created in the 1960s, is situated, the government plan is to grow the city to become one of the largest in England.

The Regional Planning Guidance for the South East (Government Office for the South East, 2001) – recently replaced by the South East Plan 2006-2026 (South East England Regional Assembly, 2003) – identified the general area of MK and the South Midlands to be one of the four potential growth areas in the wider South East of England. The resultant sub-regional study gives an overview of the nature, extent and location of planned urban development. The Milton Keynes & South Midlands Sub-Regional Strategy (Government Offices for the South East, 2005) considers the sub-region located between London and the wider Midlands. This sub-region covers 4,850 sq. km and has a population of 1.5 million. The regional centres are Milton Keynes, Northampton, Luton – Dunstable – Houghton Regis and Bedford – Kempston. Key features of the sub-region are that there is no dominant urban centre; that economic growth rates have been high but uneven; that improvements need to be made to transport and community infrastructure; that the local economy needs to be diversified and upgraded; and that it contains environmental assets of national importance and regional interest (Government Offices for the South East, 2005).

The sub-regional strategy for the MK area requires 48,850 new dwellings to be added to Milton Keynes. Therefore, the Milton Keynes Growth Area Water Cycle Strategy (MK WCS) process was recently launched by Milton Keynes Council and its partners (Steering Group) to foresee the impact that planned urban development might or will have on the water cycle itself. The WCS process is looking at water treatment, water quality, flood risk management, integrated urban drainage management and sustainable urban drainage systems (SUDS), and the strategic delivery of water resources. Additionally it looks at possible methods of household water demand management. The focus of this thesis will be to critically assess the WCS process, and explore its wider relevance.

## 1.2 Research Aims, Objectives and Questions

### 1.2.1 Research Aim

To critically assess the MK Water Cycle Strategy (WCS) process to provide insights into how sustainable water management, required by among other things the Water Framework Directive (WFD), may be realised and integrated within spatial planning in England.

### 1.2.2 Research Objectives

Having defined the aim of the research several research objectives were developed to meet it:

1 To critically review the relevant literatures, other necessary national guidance, and secondary sources in relation to:
   - the origins and principles behind, and attributes of the WCS process and its outputs;
   - interactions between the local spatial planning process, the implementation of the WFD, and the WCS process in England.

2 To identify the stakeholders involved in the MK WCS process and understand how they interact and influence the preparation of the MK WCS.

3 To identify factors influencing the process of evidence change in relation to the MK WCS process.

4 To explore the implications of the MK WCS on the spatial planning processes which aim to promote the sustainable development of MK.

In addition to the aims and objectives above, several research questions were derived. These were developed to help meet the research objectives. Because the research questions were derived from the objectives they are closely related (Table 1).

### 1.2.3 Research Questions

a) What is the specific contribution of individual stakeholders to the overall conceptual framework of MK WCS process and how does the process influence them?
b) What relationships can be observed between the implementation of the WFD and the activities of the key stakeholders involved in the MK WCS process?
c) How do the stakeholders perceive the quality of evidence that feed into the WCS process, for the case study of MK WCS?

| OBJECTIVES | RESEARCH QUESTIONS TO HELP TO COMPLETE THE OBJECTIVES |
|---|---|
| To identify the stakeholders involved in the MK WCS process and understand how they interact and influence the preparation of the MK WCS. | What is the specific contribution of the stakeholder to the overall conceptual framework of MK WCS process and how does the process influence them? |
| To identify factors influencing the process of evidence change in relation to the MK WCS process | How do the stakeholders perceive the quality of evidence that feeds into the WCS studies, for the case study of MK WCS? |
| To explore the implications of the MK WCS on the spatial planning processes which aim to promote the sustainable development of MK | What relationships can be observed between the implementation of the WFD and the activities of the key stakeholders involved in the MK WCS? |

Table 1: The research objectives in relation to the research questions.

## 1.3 Scope of the research

The scope of this study focused on the geographical area of the Milton Keynes Council (MKC), located within the South East of England. The case study research is based on the MK WCS process and stakeholders included in its Steering Group. Additionally to the MK WCS Steering Group, the research focused on a sample of additional stakeholders and experts. The groups of stakeholders participating in the research were:

- The MK WCS process Steering Group,
- Bedford and Marston Vale WCS process Steering Group,
- Cranfield University experts from School of Applied Sciences,
- Anglian River Basin District Liaison Panel (ARBDLP), and
- Experts of various UK governmental organisations.

## 1.4 Thesis Structure

The thesis is divided in seven chapters. In *Chapter 1* the background to the research, and the aims and objectives of the research are presented together with the research questions and scope of the thesis. In *Chapter 2* the findings obtained from literature review and focusing on the MK WCS are presented. The literature review focuses on interconnections between two very dynamic sectors in England; spatial planning and water management. In this chapter the emphasis is put on reforming spatial planning process in relation to water management and the influence of the Water Framework Directive on this in particular.

In *Chapter 3* the theoretical basis for the exploratory nature of the research is articulated and the research methodology developed to meet the aim and objectives of the research justified. The application of the research methodology is explained. The research findings reported in *Chapter 4* are organised in three stages and finish with a summary of findings. The thesis continues with a discussion in *Chapter 5* which is divided into three parts – Stakeholders, WFD implementation and Evidence quality. The conclusions from the research thesis are presented in *Chapter 6*. To better understand the phases of this research, the structure is additionally presented in Figure 1. The conceptual framework for the research was adapted after Edwards (Edwards, 1998).

| | |
|---|---|
| **PHASE ONE** | |
| Descriptive work | |
| Exploratory – descriptive work | **Chapter 2:**<br>Context of Water Cycle in urban planning and comparative study of 2 Water Cycle Strategies. Additionally drawing out the interrelations with the WFD.<br>**Chapter 2:**<br>Findings obtained from literature review and focusing study of the MK WCS drawing on interconnections between **a)** spatial planning, and **b)** water management and **c)** evidence. Main point is a reform of spatial planning process in its relation to water management, particularly Water Framework Directive. |
| Focused – descriptive work | **Chapters 3, 4, 5:**<br>Justifying methodology and explaining undertaken approach with its application. Geographically and ideologically contextualising the phenomena. Summarising a meaningful story of stakeholder's experience of the WCS process and presenting their view of the process. |
| **PHASE TWO** | |
| Theoretical – Heuristic Work | |
| Grounded – Theory Building | **Chapter 4, 5**<br>Building a story out of observation of MK WCS process – stakeholders, WFD compliance and evidence quality. Reflecting on literature and other cases. |
| Hermeneutic work | **Chapter 5:**<br>Critically testing the findings from analysis of collected data with reflecting on the findings of literature review. |
| **PHASE THREE** | |
| Theory – Testing Work | |
| | **Chapter 6**<br>Summarising findings about the phenomena with reflecting on methodological weaknesses of research and possible further research. |

Figure 1: Thesis structure divided into phases of research (adapted from Edwards,1998).

# Chapter 2: Literature review and inter-connections

*In this chapter the context of the Water Cycle Strategy is provided. The WCS process is presented as an interface between two regulatory frameworks: sustainable water management as stimulated by the WFD and spatial planning for urban areas in South East England. The emphasis on reforming the spatial planning process is made particularly in relation to the Water Framework Directive. At the end of the chapter the Aims and Objectives are reassessed in light of literature review findings.*

## 2.1 Introduction

The literature findings are organised in three parts. There is a clear cause and effect interrelation between them, visualised in Figure 2, below:

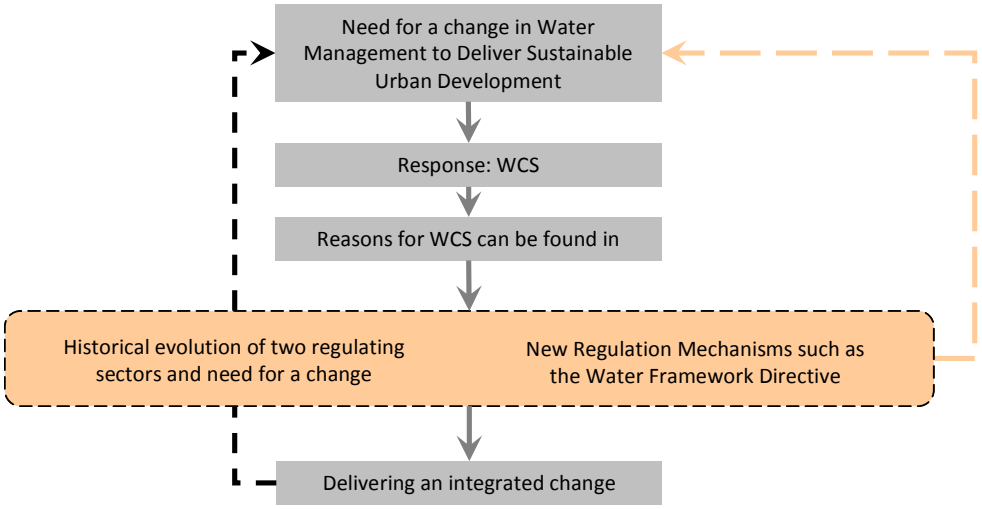


Figure 2: Literatures review sectors and their inter-relationships.

An explanation of the WCS process as it may be used in contemporary integrated spatial planning in England is presented in the first section. A strong relationship between the WCS and spatial planning processes and the WFD (currently believed to be the strongest piece of legislation in water management (Section 2.1.1)) was observed. The role of spatial planning in water management in England is presented in the second section (Section 2.1.2). And finally, the findings concerned with the role of evidence in spatial planning and the WCS process, are discussed in the third section of the literature review.

### 2.1.1 The context for Water Cycle Strategies

#### 2.1.1.1 What is a Water Cycle Strategy?

Water Cycle Strategy is an expression used in current spatial planning in England, to describe (a) a multiple-stakeholder process focusing on sustainable water management for urban growth areas, and (b) how the needs of the water environment and the provision of each of the element of water services infrastructure may be considered together i.e. in the water cycle (Environment Agency, 2007). The process is not solely an infrastructure need check list; to some extent it encourages planning of reduced water consumption, and recycling and re-use of water with forward looking on future water standards. The Water Services Infrastructure Guide (WSIGu) refers to the WCS as *the best practice* because it allows for sustainability of urban growth to be fully addressed prior to the actual development. The process of WCS ends with a spatial strategy that allocates the land for urban development and presents a strategy for sustainable water management for urban development (Environment Agency, 2007).

WCSs are a response to the UK Government's urban growth agenda, which aims to reduce the pressure on urban growth in bigger cities like London, accommodating such growth elsewhere. In response to this, several growth locations (GL) have been identified across the country in different regions of England, amongst them Milton Keynes and the South Midlands (Communities and Local Government, Accessed 26th August, 2008). Growth areas are expected to extend beyond the current built area of cities. Though the growth areas in their according catchments are expected to add a relatively small proportion of land area to built areas, it is considered that their impact on the water environment within the catchment would be significant. This concern is what makes WCS studies an important environmental policy in spatial planning in England. For example, the size of the Bedford and Upper Ouse Catchment area is 27,890 sq. km (Environment Agency – More about Anglian RBD, Accessed 28th August), while the growth area of Milton Keynes is roughly estimated to be 85 sq. km (Scott Wilson Ltd, 2008), which is less than 0.3 % of the catchment area. More details of the case study area can be found in Appendix A.

The WCS process is a relatively new process in river basin planning which is specific to the spatial planning in England. The aims of the WCS process are to (a) assess resilience/sensitivity of local water environment to urban development, and (b) address infrastructure and local water resource management solutions for a particular urban growth area. It is important for the WCS to foresee the limitations of the specific water environment and existing water infrastructure. This way cost estimations and feasibility studies for alternative solutions can be prepared. Moreover, different water use efficiency measures can be explored (Environment Agency, 2007).

Parallel to the WCS process there is a requirement for a strategic approach to development in England (within Regional Spatial Strategies and Sub-regional Strategies), which is asking local planning authorities to provide an evidence base to support the Local Development Frameworks[1] (LDFs), consider the impacts of water-use efficiency measures and provide an overall cost estimate for identified solutions. Even though the WCS process is site specific, they can easily be placed within the corresponding catchment of a river basin district, as defined by the WFD. The WCS process is meant to encourage strong partnership collaboration within the so called *Steering group* (key-stakeholders). However, in practice the work for the study is outsourced to consultants and so the whole strategy is produced by a private water engineering company (WSIGr, 2007).

The main research questions of every WCS, according to the WSIG guide, are outlined below in Box 1. It appears that there are two different sets of questions within every WCS process. In some the estimation methods seem to be straightforward, e.g. when concerned with changes in local water demand, implementation of effective and sustainable surface drainage systems, flood risk management, water supply and impact on water environment.

[1] LDF is a spatial planning strategy, enforced by Planning and Compulsory Purchase Act 2004

Box 1: The main research questions of WCS studies

- **assessment of change in local demand for water due to population growth**; taking it further to water demand management where some of the new modelling and conceptual approaches are being considered;
- **implementation of effective and sustainable surface urban drainage system**;
- **flood risk management**, where the process is using flood risk zones provided by EA, and modelling approaches coupled with GIS software are being used;
- **looking at water supply**, in sense of WTW infrastructure requirements/capacities and need for additional water resources (existing reserves, new reservoirs, inter-basin transfers, or desalination);
- **impact on water quality** which is directly connected with effectiveness of WWTW. Again different approaches, linked also with demand management, are considered. The standards and monitoring are set by EA. The current status of water bodies and it maintenance in the future are driving decision making towards the assurance of new water resource (reservoir, desalination, pipeline or canal inter-basin transfer).

More concerning are questions of water demand management or acceptability of the additional changes to hydrological systems (cumulative effect of urban growth, additional reservoirs, inter-basin transfers and desalination). It is where strategies become unpredictable and their validity questionable (Furey and Lutyens, 2007). Similar arguments apply to the WCS methodology. This is the point where water cycle becomes a system of growth interest. Collins et al. (2007) say that catchments are systems of uncertainty, complexity and conflict. In catchments scientific understanding is essential and the formation of a scientific evidence base necessary. However, when sustainable management of water resources is the overall aim, the evidence base is just a part of how stakeholders perceive catchments (Collins et al., 2007).

A part of nationwide responsibility for implementing the WFD (with its underlying directives) is transferred to Local Planning Authorities[2] (LPAs) through spatial planning process. The spatial planning system is therefore used as a tool for implementing the WFD. Some of the important documents in shared responsibility for implementing the WFD [in England] are presented in Figure 3. The LDF, where the WCS studies are fed in, has to go through (a) *Sustainability Appraisal*, which is a process of assessment of the environmental effects of plans and policies, and including planning documents, and (b) *test of soundness* by an independent Planning Inspector that would examine the LDF to see if the minimum requirements have been met in terms of process (as defined by The Planning Inspectorate, Accessed on 5th March, 2008). As these requirements are included in LDFs we return to the initial requirement for *evidence – based planning*. Evidence used within LDFs has to support whatever decisions or plans are made.

The WCS studies are usually divided into three stages: Initial Scoping, Outline Strategy, and Full Strategy. The first stage is where partners agree on issues that need to be tackled in the WCS process providing an initial study of the growth area and its surroundings. The second stage should determine what and when Water Services Infrastructure (WSI) should be provided, ensure housing and commercial space provision does not surpass WSI capacity, support decision making, consider cost estimates, climate change, the WFD requirements, SUDS, and report on emerging best practice cases for sustainable development. The *Full Strategy* should be considered in the third section and in a site specific, case by case manner identify constraints to development (Box 2) (Scott Wilson Ltd. (2007), Environment Agency, 2007).

[2] LPAs are local authorities empowered by law to exercise planning functions for a particular area.

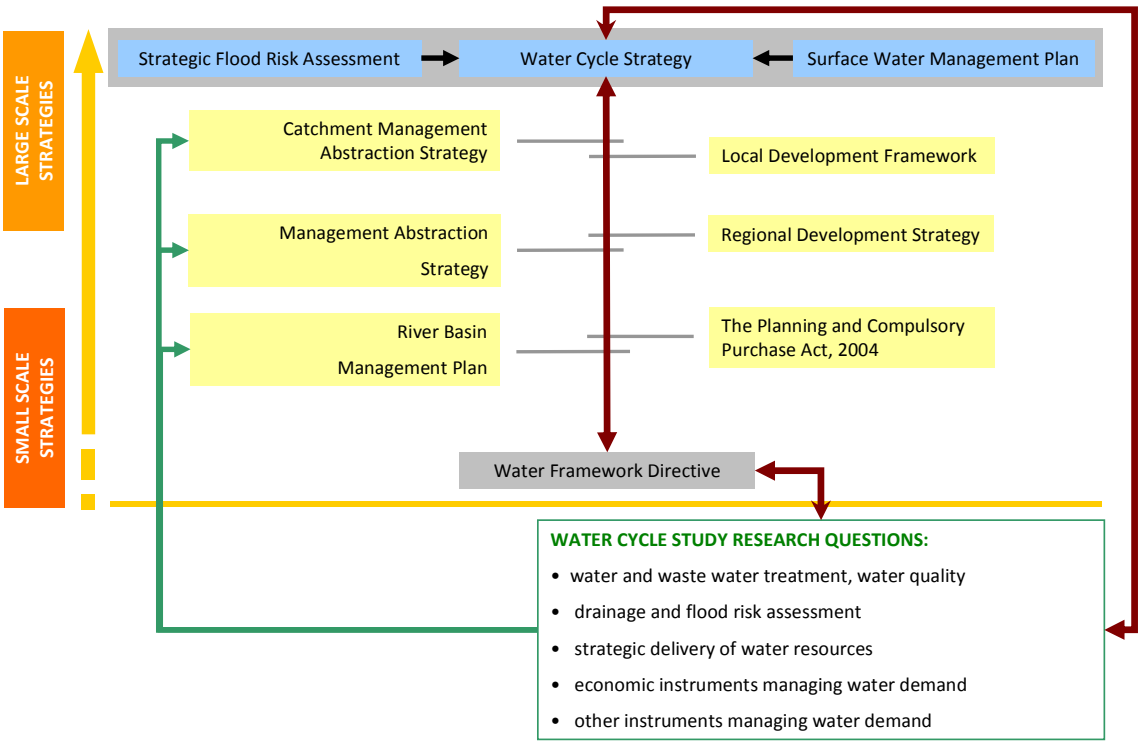


Figure 3: Some of the key policy interactions between the WCS and spatial planning in devolution of responsibility for meeting the objectives of the WFD.

**Box 2: Expected framework of the WCS process (Environment Agency, 2007)**

**(1)** **WCS starts with Inception** where the project is set up, the Project Group is formed and a report followed after a meeting is made.

**(2)** This part feeds in to **Strategy Overview** where stakeholder liaison and review of data of relevant documents take place (like South east Plan, Milton Keynes Sub-Regional Strategy, MK Green Infrastructure Plan and Anglian Water Service's draft water Resources Plan 2009). According to SW this stage is necessary to agree on assessment methodology tools and refine strategic requirements of the WCS.

**(3)** Following by **Strategy development** the plan is to establish the current water related environment and water infrastructure baseline; identify proposed areas of development and scenarios that need to be assessed; define infrastructure requirements and derive options for providing it; and finally review and agree on assessment methodologies.

**(4)** Done this CO planned an **Option assessment** as the next step requiring more site specific approaches to provide an overview of the strategic and key infrastructure options and requirements to support the development scenarios.

**(5)** This step leads to **Infrastructure Management Evaluation** summarising the relevant data into guidance and documents to support and ensure effective implementation of the final WCS including information on broad cost estimates for infrastructure, advice on developer contribution opportunities, water efficiency targets etc.

**(6)** Finalisation of process is made by **Report Dissemination** or better production of final reports and data assimilation in GIS together with providing objectives for more detailed Full Strategy step of the WCS.

**(7)** The process finishes with **Final Report Issue**.

Different stages of the WCS process, according to the WSIG guide and Environment Agency, require different organisations (key-stakeholders) during the process of WCS preparation (Figure 4). Later planning applications have to be compliant with the WCS.

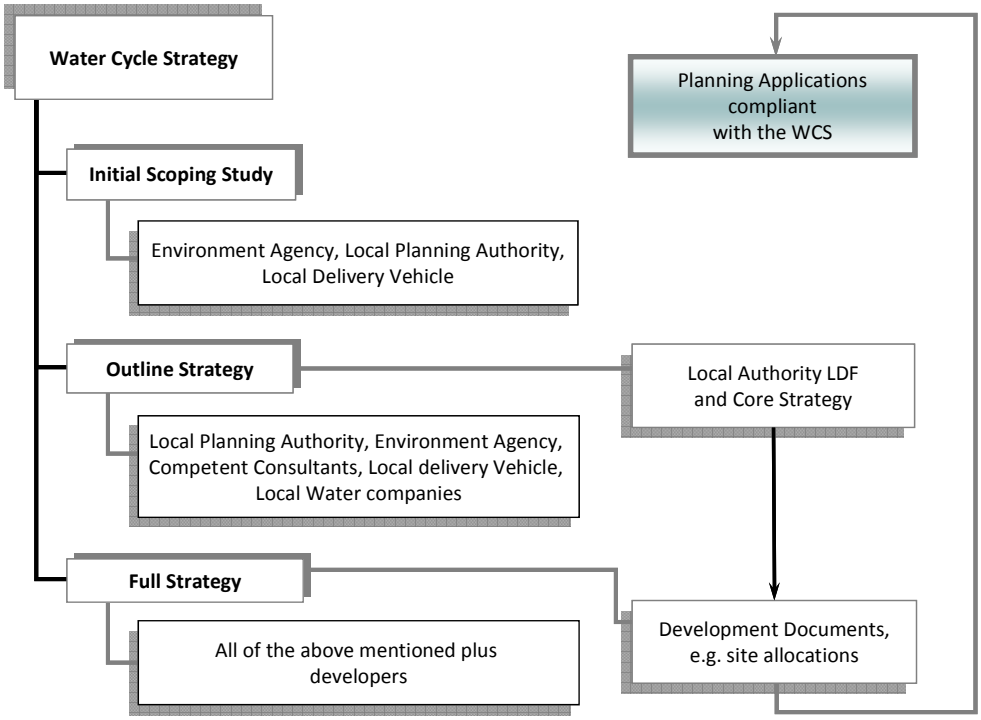


Figure 4: Water Cycle Strategy framework, adopted after the Water Services Infrastructure Group (Environment Agency, 2007).

#### 2.1.1.2 Comparative study of two Outline WCSs

The only paper available describing the WCS process, is authored by Furey and Lutyens (2007). Since the literature on WCS process is limited, a comparative study of two Outline WCS studies was used to explore where the strategies are similar and where they take different approaches with identifying the cause that generates a variation between the two WCSs. The aspects chosen to compare were identified after consulting a representative of a water company who was involved in preparation of several WCSs in the Anglian RBD and had a good overview over both WCS processes. Two Outline WCS projects were compared: Milton Keynes Water Cycle Strategy and Cambridge Water Cycle Strategy. In Appendix B an overview table of this comparative study is available. According to the aspects examined the comparison generated five conclusions, set out below:

**ASPECT 1:** ***Consultancy doing the Outline WCS***

**CONCLUSION 1**: the chosen Outline WCS strategies were completed by different consultants, who have both completed other WCS projects.

**ASPECT 2:** ***Location of the Outline WCS in the WFD sense***

**CONCLUSION 2**: Both Outline WCSs are located within the Anglian River Basin District (ARBD), where water resources are scarce, groundwater is sensitive to pollution, surface waters under pressure of pollution both from point and diffuse sources, where agriculture is an important sector of industry and where urban growth is sought to be an important economic boost factor for the region. This makes consideration of how sustainable water management is going to be implemented in the river basin of these growth areas important. The growth areas are important for the ARBD and the WFD because the WCS process within examines the possibilities for implementing measures under the forthcoming RBMP.

***ASPECT 3: Range of issues covered in the Outline WCS***

**CONCLUSION 3**: The WCS studies cover the same range of already expected water issues. Both have their own style of presenting the work. However, they have the same minimum standards as both consultants followed the Water Services Infrastructure Guide while preparing their work.

***ASPECT 4: Methodology undertaken for the Outline WCS***

**CONCLUSION 4:** The issues looked at in Aspect 3 differ in one point. Consultant (CO) made explicit use of the traffic light system matrix for assessing the potential for urban growth in MK region. This explicitly shows SW made an effort to demonstrate transparent decision making.

***ASPECT 5: Quality of the Outline WCS and added value***

**CONCLUSION 5:** Both of the WCS studies added their own special component to the Outline WCS. It can be observed that the two working groups found different issues that could be added to the Outline WCS. In the case of MK WCS the added value is a transparent and explicit demonstration of where the practical and

scientific evidence exists, where assumptions were made and what the limitations and implications of these were. In the case of the Cambridge Outline WCS the group recorded limitations in the current national system of Water Provision, Management of Flood Risk and Surface Water Management. In their critique they prepared and visualised an overview of current approaches, drivers for change, barriers to change, responses, roles of stakeholders and actions and timing problems.

#### 2.1.1.3 Conceptual relationship between WCS and the WFD

Since the relationship between WCS and WFD is not explicitly described in the literature, the requirements of the WFD had to be viewed in the light of WSIGg. In the course of the research a simple content analysis was performed. This shows that the WCS is closely related with the WFD and sometimes uses the same principles. The difference is that the WFD aims to act nationally and regionally, while the WCS provides a local analysis of the water environment nested in the regional and national context. Nevertheless, the aims, objectives, guidelines and aspiration of the WCS are reflected in several articles of the WFD. This is further discussed below and systematically shown in Appendix B.

Appendix C provides an overview of the potential benefits of WCSs in River Basin Management Planning (RBMP) and the implementation of the WFD as well. The articles of the WFD that relate the most to the WCS are Articles 1, 4, 5, 6, 7, 8, 9 and10. For instance in Articles 5 and 9 the relation to the spatial planning process can be observed. A WFD recommendation is to review the impact of human activity on the status of surface waters and groundwater. This is achieved in the WCS process and acted upon with Codes for Sustainability (prescribed standards to overall sustainability performance of a home). Similarly in article 9, where spatial planning is observed in practice, it is shown that a tariff agreement principle can be introduced through spatial planning process which in return should assure the users have opportunity to use water more efficiently (so as Codes for Sustainably for building standards should do). It is an incentive that should motivate developers so that more sustainable development is planned. Similarly to Article 6 of the WFD, the WCS process identifies the protected

areas and not only reviews the register but also includes the protected areas such as Sites of Special Scientific Interest (SSSI) so as to consider them and plan measures for their further protection. From the WSIG guide it seems that the WCS process should positively contribute towards WFD implementation through:

- controlled environmental change and future meeting of the WFD objectives,
- sustainable urban development;
- planning urban growth within the acceptable limits of current/future water standards;
- delivering equilibrium to the water supply/demand relationship;
- foreseeing the monetary cost of delivering the development plan into practice (including costs from environmental impact assessment mitigations measures);
- avoiding any unacceptable impact of new housing development on the environment; and
- making monetary valuation of cost that will enable sustainable development.

From Section 2.1.1 and its sub-sections it is evident that the WCS process of ex-ante environmental impact assessment, results in a technical document that seeks to foresee the implications of new urban growth and identify the potential for growth from the water cycle perspective and considering the cost estimates of the planned development. Comparative analysis of two Outline WCS implied there can be slight variations between WCSs, depending on the nature of the working group performing the study. Also, different value can be added to the WCS, as seen from the comparative analysis, which can express a need for a change in different regulating and non-regulating sectors in England. For instance the WCS process can recommend changes in monitoring programmes of different organisations. From a content analysis of the WFD, which was viewed in light of WSIG guidelines, it can be concluded that the WFD and the WCS are closely related in their principles and an assumption was made the WCS is relevant to the implementation of the WFD.

### 2.1.2 Spatial planning and water management

#### 2.1.2.1 Influence of the European Union

Generally spatial planning refers to any land use or physical planning system, meaning a certain form of government action to regulate development and land uses (Cullingworth and Nadin, 2002). Thus planning is a policy sector along with others such as agriculture or environmental protection. However, the European sense of spatial planning refers to "*integration of the spatial dimensions of sectoral policies through a territorially based strategy*" in which planning "*seeks to identify and address the contradictory effect of sectoral policies and the opportunities for synergy through the territorial strategy*" (Cullingworth and Nadin, 2002) e.g. newly planned urban development versus meeting the objectives of the WFD. Currently, spatial planning covers several aspects such as policy-making and integration, public participation, agency stake-holding and development management and therefore presents an integrative mechanism for coordinating diverse strategies (Holder and Lee, 2007).

Spatial planning is not a static discipline; it is dynamic and reformed at regular intervals to deal with new issues and pressures. A brief overview of the English planning system is given below to understand **(1)** the dynamics of the UK planning system and **(2)** highlight its interface with the WFD

The *Housing, Town Planning Act (1909)* is the Act in which the terms *planning* and *amenity* were used in legislation for the first time in England. The latter still stands for a concept interlinking current sustainable development to the first legislation. This was followed by *The Housing, Town Planning Act 1919* and *Town and Country Planning Act 1932* which both required preparation of schemes to regulate general land use. Though the developers should have followed the schemes prepared by boroughs and urban districts there was a lack of measures taken if they did not comply. By 1942 only 5 % of England and 1 % of Wales was covered by the Acts due to private landownership and lack of schemes (spatial plans were referred to as schemes). The post-war time therefore assured the control of development in the *common good* with

nationalisation of development rights. A land mark in the UK planning system was *The Town and Country Planning Act 1947*, which strengthened the state's control over development by requiring development plans prepared for every area of the country and by subjecting every development to approval by the local authority (Holder and Lee, 2007).

The Acts mentioned so far dealt with urban areas. The *Agriculture Act 1947*, *Report of the Committee on Land Utilisation and Rural Areas (1943)* (for agriculture and forestry) and other pieces of legislation put more emphasis on wildlife protection and landscape amenity preservation. Because the development under the schemes of The Town and Country Planning Act 1947 was slow it was upgraded with the *Town and Country Planning Act 1968*. Thus strategic and local (detailed) plans were introduced, followed by acknowledgement of the need for public participation in the report *People and Planning* (Committee on Public Participation in Planning, 1969), long before the *Aarhus Convention* (ratified in UK on 24th February 2005) (Holder and Lee, 2007).

Later in the 1980s the public participation was not only considerable but also contra productive (because serving private interests) thus the role of local plans in development was weakened. The *Town and Country Planning Act 1990*, and growing pressure from international and European Community law obligations, changed that by with defining that local planning authorities should primarily have regard to the development plans. The first real inclusion of the EU into planning and environmental protection system of its member states is in the *Directive on environmental impact assessment (1988)* (Holder and Lee, 2007).

Further changes in planning systems followed with a German initiative for a permanent Conference of European Ministers, and continued with publication of *Europe 2000: Outlook for the development of the Community's Territory* (EU, 1991) with the aim of improving awareness of European-wide spatial development issues. The Commission's subsequent report, 3 years later, *Europe 2000+ Cooperation for European Territorial Development* (EU, 1994), sets preferred future development patterns for the European territory. The main emphasis was on polycentric urban systems, protection of areas of

environmental importance and the problem of land abandonment (Cullingworth and Nadin, 2002).

In 1999 the Committee on spatial development upgraded this study with a more coherent spatial planning document entitled *European Spatial Development Perspective* (EU, 1999). The first active promotion of spatial planning in Europe ran from 1996 to 2000 under the name *Interreg IIc*, promoting strategies for sustainable development, international collaboration and implementation of Community policies. The idea was that more efficient planning would result in more equally developed territory, and thus more social and economic cohesion which would result in better competitiveness of the Community. The Interreg IIc, and the current Interreg IIIc influenced UK spatial planning immensely, although the UK government is more enthusiastic about exchanging experience rather than building an overall single planning strategy (Cullingworth and Nadin, 2002).

*The Planning and Compulsory Purchase Act (2004)* finally presents spatial planning as an integrative mechanism (integrative spatial planning) (Holder and Lee, 2007). Supported by the *Sustainable Communities Plan (2004)*, the *UK Strategy for Sustainable development (2005)* and the *European Spatial Development Perspective (1999)* it forms the most national-like spatial strategy of England at the moment (Kidd and Shaw, 2007). It brings noticeable changes especially into regional and local planning such as timely delivery of plans and a higher requirement for a sound evidence-base. Thus the Regional Spatial Strategy (RSS) (former Regional Planning Guidance) provides a regional plan for development which Local Development Frameworks (LDF) (former local development plan) are prepared to realise at the local level; the two therefore became the centre of spatial development, the main connectors of different policies and the main promoters of sustainable development (Nadin, 2007).

According to Planning Policy Statement 12 (PPS12) the new LDFs are *intended to stream line the local planning process and promote proactive, positive approach to managing development* (Department for Communities and Local Government, 2004).

The new system has six major aims (Department for Communities and Local Government, 2004):

- **flexibility**, which allows for local planning authorities to be more responsive to local changes and prepare and review spatial plans quicker than development plans in the past;
- **strengthening community and stakeholder involvement** by involving them in the preparation of the local development documents;
- **front loading**, meaning making key decisions early in the preparation of the documents or reach consensus on essential issues earlier to avoid major changes later;
- **sustainability appraisal**, to ensure local development documents actively contribute towards sustainable development;
- **programme management**, essentially meaning the efficient management of the process of preparing a suite of local development documents in accordance with a local development scheme; and
- **soundness**, meaning local development documents must be soundly based in terms of their content and the process by which they are produced. Moreover they have to based upon a robust and credible evidence base.

The shift of power from the central to regional and local government means RSSs and LDFs form the main guidelines for future development and implementation of a number of national policies. A significant influence of the EU on the dynamics of the UK's spatial planning system makes Regional Planning Authorities (RPAs) and Local Planning Authorities (LPAs) (Cullingworth and Nadin, 2006) some of the key implementation bodies of the WFD. A workshop, organised by the Department for Communities and Local Government (DCLG), established the key objectives of the WFD relevant for to planners as: *to prevent deterioration and improve the water status, contribute to mitigating the effects of floods and droughts, and ensure sustainable use of water resources* (Department for Communities and Local Government, 2007). This aim fits into the WCS process and WFD likewise.

#### 2.1.2.2 Urban development and Water Resource Management in the UK

*Across Europe, economic development has physically altered rivers and other waters for navigation, flood control and other purposes. Barge canals and hydroelectric reservoirs have been created where no water bodies previously existed* (European Commission, Water Information System for Europe, note 4, 2008). In this sense the UK was no exception. The long history of water resource management in the UK has had significant hydrological and geomorphological impacts on its natural watercourses. The modifications in channel form, in the rate of processes, in the role of vegetation and connectivity with floodplains go beyond a single stream and consequently reflect in catchment scale hydrological changes. The modifications observed due to groundwater abstraction, building of dams and inter-basin water transfers are directly linked to demographical dynamics and hence spatial planning. When describing changes it is important to define not only the scale of change but also the scale at which the change is observed (Acreman, 2000).

Although the overall freshwater reserves surpass the historical and current demands, the regional water demand variability undoubtedly causes differences within and between catchments. The biggest hydrological changes in the UK due to humankind occurred during the last 200 years. The estimation is that only 15 % of the UK flows, measured by gauging stations, are natural while the remainder is either stored in the reservoirs, is affected by flow augmentation from surface reservoirs and/or groundwater storage (e.g. power generation), is abstracted for public, industrial and agricultural needs, or becomes a receiving body of outflows from sewerage treatment works (Gurnell and Geoff in Acreman, 2000, p. 83-90). Moreover, it is estimated that only 15 % of the river flows in the UK is natural (Marsh, Black, Acreman and Craig in Acreman, 2000, p.101). The influences of water management on hydrology can be observed through **(1)** field drainage, **(2)** dam building, **(3)** inter-basin water transfer, and **(4)** groundwater abstraction.

A significant change in agricultural production and river flows of the UK relates to field drainage (system of sub-surface drain pipes usually combined with open surface drains)

(Robinson et al. in Acreman, 2000, p. 34-36) affecting agricultural production by lowering the water table therefore making crop production and animal grazing less sensitive to hydro-geological and weather conditions. Because the water from drained fields moves much faster towards the receiving water courses it affects the natural flows of water bodies and the water quality.

There are about 450 large dams in the UK today, serving water-supply, flood control and hydro-electric power production needs. Inter-basin water transfers were initially built for transportation means. For instance there ware 2000 km of canals constructed between 1770 and 1830. Not until the mid-nineteenth century was the canal construction used to any great scale to meet the water supply needs. With water being abstracted from one and effluent being released into another, these activities crossed the boundaries of catchments. As Grunnel and Petts (cited in Acreman, 2000, p. 93-97) summarise, the hydrological changes of the past resulted in degradation of habitats, loss of connectivity with floodplains, decline in fisheries, reduction in biodiversity and loss in conservation value. Thus considerations about sustainability of the current water management system have been raised and the objectives of exploitation broadened; from the multi-purpose approach in the 1919s to the integrated water management approach in the 1980s, or from ensuring the minimum flow to taking into consideration social and environmental values. This principle is reused in the Environment Act 1995 under the expressions “sustainability”, “precaution” and “effective demand management”.

The practice of groundwater abstraction is yet another result of the spatial distribution of population and its water supply. Groundwater provides a third of public supply needs and presents less than 15 % of total water abstraction (Adams et al. in Acreman, 2000, p. 152) although abstraction is highly spatially variable. It is a highly convenient source of water and has a long history of management. The overall consumption for industrial and public use rose from the mid-eighteenth century, through the Second World War to the 1950s, however groundwater use stabilised by 1990 and it’s now less than recharge**.**

Two important contributions during the period prior to the implementation of the WFD, were Catchment Abstraction Management Strategies (CAMS) and Resource Assessment Management (RAM) Frameworks. As described in Holmes et al. (2004) the procedures are designed for the catchment based establishment of river flow objectives as well as assessment of water resources within the catchment. Though this system of planning focuses more on organizing the abstraction licensing, it does resemble some characteristics of the WFD and its goals. If the WFD acts more as an overall connector between different water legislation on a(n) (inter)national level, the CAMSs and the RAM Frameworks act on a sub-catchment and catchment scale. Despite differences in scale, CAMSs are concerned with balancing the abstraction and recharge. Because CAMSs define how much water is available for abstraction within certain a catchment, they present one of the most limiting factors to spatial planning and of course urban development.

Urban development has influenced water quality. The changes from natural state of water quality in a catchment are caused by a complex mix of abstraction and diffuse and point source pollution. Diffused source pollution is caused by agricultural land use, while point sources are mainly in urban areas i.e. *sewage treatment works discharging nitrate, nitrite, ammonia, BOD, phosphorous, surfactants and steroid oestrogens and industrial effluents containing micro-organic, heavy metals and solvents* (Williams et al. in Acreman, 2000, p.p. 134 - 146) and industrial discharges carrying a range of potentially damaging contaminants.

According to Morrison (2004) the WFD measures are already in force under several other directives and policies, namely: Urban Waste Water Treatment, Sewage Sludge, Bathing Waters, Freshwater Fish, Habitats, Groundwater, IPPC, Abstraction, and Nitrates Directive. These are all, to varying extent, limiting the urban growth, and the WFD has the power to even go beyond those standards with additional measures if these do not result in good ecological status. By affecting urban growth it also affects the stakeholders involved in the delivery of growth. The main characteristics of the WFD are summarised in the next section.

#### 2.1.2.3 Water Framework Directive

The WFD has its roots in the basic principles of the Treaty of Rome and the UN Conference on Human Environment and was developed through EU Environmental Action Programmes that took place between 1973 and 2000. The core of the Directive relates to providing a high level of protection, use of the precautionary principle, preventative action, dealing with sources of pollution, adopting the polluter pays principle, integrating water and environmental protection, using available scientific and technical data, taking account of both costs and benefits and recognizing the need for international collaboration (Cullingworth and Nadin, 2002). It is the first directive to link water quantity and water quality considering the fact that the amount of water available is a significant parameter in determining the concentration of polluting chemicals and that the water quantity also affects the ecological status of a water body. As groundwater is an issue in sustaining good water status, the directive requires that integrated planning for future water demands has to be fully considered (Chave, 2001).

For river management purposes River Basin Districts (RBD) are defined in the WFD as areas of land and sea made up of one or more neighbouring river basins together with their associated groundwater and predefined coastal waters. RBDs – areas of land through which surface waters flow to the sea, therefore representing the physical attributes of the river basin district – act as the main units for management of the river basins. It is up to governments to decide on the number of administrative units per district or the number of districts sharing the unit for the purposes of defining competent authorities that will be in charge of implementing and enforcing the provisions of the directive (Chave, 2001). The River Basin Management Plans (RBMPs) required by the WFD represent the main planning and working agenda (Environment Agency, 2006).

Objectives as listed in the directive are (Chave, 2001):

- To expand the scope of actions to protect water to all forms of naturally occurring water in the environment, including surface and groundwater;
- to prevent further deterioration, protect and enhance the status of aquatic ecosystems, terrestrial ecosystems and wetlands;

- to promote sustainable water use based on long-term protection of available water resources;
- to contribute to mitigating the effects of floods and droughts; and
- to undertake measures which will result in achieving the "good status" or "good ecological potential" of waters within predetermined timescales.

The WFD has several features which make it special, aiming for the following results (Chave, 2001):

- to manage water as a whole on a river basin basis reflecting the situation in the natural environment;
- to use a combined approach for the control of pollution, setting emission limit values and water quality objectives;
- to ensure that the user bears the costs of providing and using water reflecting its true cost; and
- to involve the public in making decisions on water management.

There are eleven RBDs in the UK (Figure 5). RBMPs for each of them have to be published for consultation by December 2008 and finalised by December 2009. Plans should cover an analysis of the characteristics of each body; review the impact of human activity on the status of surface and groundwaters and include an economic analysis of the water use. Because RBDs are based on hydrology, geomorphology and other specific features of water bodies therefore they should comply with environmental objectives.

The RBDs should try to meet the objective of good status of surface and ground waters by 2015, while as for "heavily modified" water bodies (where the pattern of flow was changed for various purposes) the status to be achieved is *good ecological potential* (Environment Agency, 2006). The directive allows for enforcement measures to be taken in case of failing to achieve the environmental objectives by 2015. Though, it is still unclear how severe such measures are going to be. After that, two additional six-year cycles (2015-2021 and 2021-2027) are planned (Chave, 2001; Howe and White, 2002). Delivering national responsibilities to the regional and local planning authorities

these bodies can help in implementing the WFD objectives. Given the burden *to have regard to* national legislation and relevant regional development plans (Holder and Lee, 2007) the local planning authorities play an important role in meeting the objectives of the WFD.

Several authors conclude that spatial planning authorities in the past failed to address environmental issues within their plans, while some recent case studies imply the opposite. The key documents of the WFD, RBMPs, will be available for spatial planners at the end of the 2009, thus unavailable to current LPAs in LDF preparation. The time mismatch, however, gives local development authorities new opportunities to rearrange their work and use new combinations of tools to meet the WFD requirements, even though a possibility of developing parallel water management systems (at least in the first cycle of the WFD) exists (Carter, 2007).

There are many other responses aiming to manage water better that occurred after the transposition of the WFD, for instance: Planning Policy Statement 1 (Delivering Sustainable Development) and Planning Policy Statement 25 (Development and Flood Risk) produced by Communities and Local Government; document called Future Water prepared by Department for Environment, Food and Rural Affairs (DEFRA), the Pitt review – Lessons Learned from the 2007 floods; the Stern Review Report and Codes for Sustainable Homes document (Communities and Local Government); all of which are connected in one way or another with water management for sustainable future growth. There is a complex process of inter-relation between the policies of water management and sustainable development, as has been demonstrated, with sometimes different drivers behind the various initiatives.

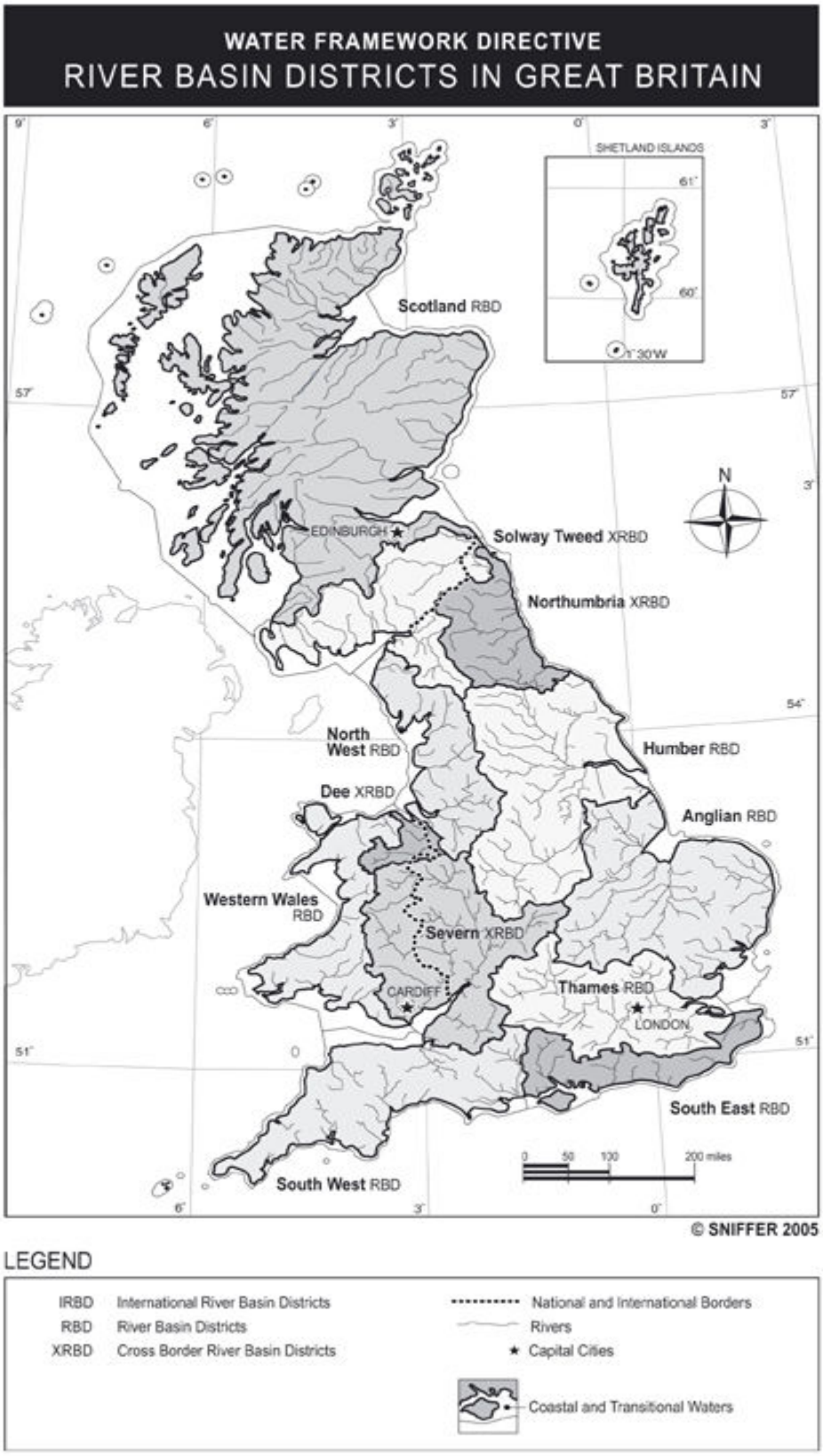


Figure 5: River Basin Districts in England and Whales (WFD UK TAG, 2007).

### 2.1.3 The role of evidence in spatial planning and WCS

As the emphasis on evidence-based planning increased in England, a whole range of responses arose in public, which are reflected in the literature. The expression "evidence – based planning" came into use in the 1990s, where the wish was to make planning less technocratic and a more interactive process (Faludi and Waterhout, 2006)

The word *evidence* is used very often, with different meanings. Since one of the objectives of this study is to look at the perception about the quality of evidence used in the WCS process, the meaning of the word "evidence" had to be closely inspected. Several authors have explored the definition, purpose and use of evidence in spatial planning, environmental studies, social research and many other areas; from qualitative to quantitative evidence; the relationship between both, the strength of one as opposed to another in the decision making process, evidence-based policy making; decision-making under uncertainty and evidence use and research quality. The following sections will touch on some of the conclusions of these studies which are relevant for this study.

#### 2.1.3.1 Defining evidence

Definitions of what constitutes evidence are wide ranging and sometimes vague. Currently, evidence is a very popular expression both in the policy making and spatial planning process in England. The expression is used in a variety of contexts with somewhat different definitions.

It is *the available body of facts or information indicating whether a belief or proposition is true or valid* (Oxford English Dictionary, 1991). As Davoudi (2006) explains, the definition sets out four points:

- facts or information are not evidence on their own until combined with other facts to prove or disapprove a proposition;

- evidence is not limited to research findings therefore includes different sources of (in)formal, expert and experiential, and systematic and tactical knowledge;
- what accounts as evidence is what is available plus accessible at given time or place;
- the question of validity is not limited only on validity of facts and information but also validity and relevance of the relationship between facts and the proposed proposition.

Evidence for policy *is any robust information that helps to turn* regulator's *strategic priorities into something concrete, manageable and achievable* (Shaxson, 2006). The evidence should be able to withstand scrutiny (Communities and Local Government, 2007) e.g. the way evidence is being used. Definitions to what is understood by the word evidence are summarised in the Table 2, which represents evidence from various sources and of various types.

| DEFINITION OF EVIDENCE | EXAMPLE AND REFERENCE |
|---|---|
| A SOURCE OR A REFERENCE | e.g. literature, scientific articles, reports, documents (Davoudi, 2006) |
| MORE THAN JUST HARD FACTS | DEFRA, 2005 |
| WHAT IT IS DERIVED FROM ANALYSIS OF DATA | Communities and Local Government, 2007 |
| BACKGROUND REPORT ON SPECIFIC TOPICS, RESEARCH | Communities and Local Government, 2007 |
| CHARACTERISATION STUDIES USED IN UNDERSTANDING PLACES, LINKED PERHAPS TO FOCUSED COMMUNITY INVOLVEMENT | Communities and Local Government, 2007 |
| FACTS | Data and known trends (Shaxon, 2006) only when they are used in conjunction with other facts to prove or disapprove a proposition (OED, 1998, cited in Davoudi, 2006). |
| WHAT INVOLVED STAKEHOLDERS EXPRESS AS THEIR OPINION, PUBLIC OPINION | e.g. regulators, policy-makers, groups, organisations and individuals with an interests (Sue Duncan, seminar "Making Policy in Theory in Practice", 10th March, 2008) |
| ALTERNATIVES | That are identified using techniques that explore possible features of way of understanding what might be possible, as well as what might be desirable (Communities and Local Government, 2007). |
| EXPERIENCE, RESOURCES, VALUES, EXPERT JUDGEMENT | Sue Duncan, seminar on Making Policy in Theory and Practice, London, 10th March, 2008 |
| JUDGEMENTS, OPINIONS, ANALYSES, SYNTHESES, ARGUMENTS, COSTINGS, REVIEWS, QUALITATIVE & QUANTITATIVE SURVEY DATA | Shaxon, 2006 |

Table 2: Definitions to what constitutes evidence, gathered from different sources.

#### 2.1.3.2 Evidence quality, research quality and evidence-based planning

When preparing a LDF it is important for the local planning authority to know when the evidence obtained is sufficient, even though there is no absolute answer to that question (Communities and Local Government, 2007). Especially in cases where alternative strategies or policies are considered, the evidence use should be explicit. In spatial planning, evidence-based planning is essentially *the transparency of the decision making process* (procedural test, conformity test, and coherence, consistency and

effectiveness test) (The Planning Inspectorate, Accessed on 5th March, 2008). Quality of planning can be described as *reflexivity* as well. Meaning the *extent to which the investigators have critically and explicitly reflected upon the methodological limitations of the research and the competing interpretations that may attach to the data* (UK TAG, 2007) – or the quality of the research.

The evidence base is built upon data, lines of argument (analysis) and stakeholder opinions (Shaxon, 2006). Gathering of evidence and preparation of the evidence base (the collection of qualitative and quantitative evidence) are not a self-contained stage in spatial planning. Moreover, an evidence base evolves as alternatives are recognised, new issues arise and consultation responses are received (Communities and Local Government, 2007). A recent report *Using evidence in spatial planning* deals with the role of evidence in spatial planning, with what sort of evidence is needed and how it is obtained (Communities and Local Government, 2007). Despite very interesting findings the report does not deal with what might be thought of as sufficient quality of evidence upon which local authorities can make developmental decisions. The quality of evidence in spatial planning is hidden in the so called *soundness of the plan*. Therefore the quality of evidence is not about its scientific validity only but also persuasiveness on the qualitative use of evidence – so called reasoning behind evidence use.

Quality is often referred to as risk or uncertainty. The difference between the two expressions, as referenced in Adams (2001), is defined as follows:

- *if you don't know for sure what will happen, but you know the odds, that's **risk**, and*
- *if you don't know even the odds, that's **uncertainty*** (Knight, 1921, referenced in Adams, 2001).

The difference between risk and uncertainty can be observed further in the sense of its inevitability. Uncertainty under the definition above is inevitable – it is in the realm of judgement and not of the calculation (Adams, 2001). However in practice, the expressions are used interchangeably. In everyday life the expression risk uses the concept of probability and magnitude of the quantified scientific definitions of risk;

furthermore the odds and outcomes are being assumed or invented rather than being precisely knowable (Adams, 2001). It seems that asking questions about the quality – risk or uncertainty – is just a part of the decision making or planning process rather than a standalone process. One would expect either that the "right" view lies in the balance of different judgements when subject/object is observed from many angles or that there are as many "rights" as there are observers. In everyday life uncertainty is described also as *danger, hazard, exposure or peril* (OED, cited in Adams, 2001).

Brown et al. (2005) review theories of uncertainty and quantification of uncertainties in environmental data. They recognise that despite applying these approaches some open questions on evidence quality still remain. Shaxson (2006) recognises that the *nature of evidence* one needs *is proportional to the nature of the risk associated with the decision that is being made*. Similarly, but slightly different, Brown et al. (2005) categorise the quality of (environmental) evidence as uncertainty, with offering a conceptual model for organising information on evidence quality with quality indices, including qualitative and quantitative expressions of probability and alternatives. A more practically-oriented definition can be found with the International Organisation for Standardisation (1986) (cited in Duncan and Harrop, 2006). It explains that quality is *the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs*. Where evidence is *unavailable*, *conflicting*, *misunderstood* or *disregarded*, there are risks to the quality / variability of decision making (Duncan and Harrop, 2007).

In such a complex system of interest, such as catchments, where evidence of various kinds is used, the definition of quality seems to be more *the totality of features and characteristics of a product or service* – in our case the MK WCS – *that bear on its ability to satisfy stated or implied needs* than the expressed degree of (un)certainty. Where evidence happens to be *unavailable*, *conflicting*, *misunderstood* or *disregarded*, there are opportunities for variable decision making as evidence of different social weights are combined. However it is hard to say if it poses risks to the quality of decision making as evidence can be just "fit for purpose" and quality in this sense depends on the expected outcome of an action or a management plan. Nevertheless,

*when the scientific fact falls short of certainty we are guided by assumptions, inference and belief…classical physics is replaced by a set of conditional and probabilistic rationalities* (Adams, 2001).

The notion of quality in decision making has been explored by several authors in the past. Some of them define decision-making as *the commitment of resources today for results tomorrow* (Chacko, 1991, cited in Oreskes, Accessed 20th May, 2008). Decision making involves premises like assumptions, beliefs and conditions therefore if premises of a conditional statement are correct the outcome should be known / predictable (Oreskes, Accessed 20th May, 2008). However history has proved that widely accepted premises can be incorrect and that science can't be the absolute solution to all the conflicting beliefs. At this point we would put forward the importance of well established monitoring system.

The questions of objectivity (quality) in research, for instance: what accounts for reliability of the knowledge produced, can elements of those aspects be transferred in means of increasing robustness of some other research, and can those elements be used for judging information, have already been raised to some degree. As Oreskes (Accessed 20th May, 2008) summarises *the vision failed historically, philosophically and sociologically*. From sociological point of view the weakness is that *it fails to account for social dimensions of scientific proof and persuasion. Verification of knowledge is* indeed *a social process*. In other words, gradual removal of uncertainties within evidence we use or provide (at the same time) means living with uncertainties. It is where *reasonable expectations* and *taxonomy of uncertainties* that *help to derive useful plan of action* go hand in hand with a *sound plan* needed in the contemporary and reformed spatial planning process.

#### 2.1.3.2.1 Descriptors of the quality of evidence

Quality of evidence and the importance of that quality in decision making process are as diverse as the definitions to what constitutes evidence or quality are. Definition that quality is an ability of bearing satisfied or implied needs is a definition that *embraces both methodological appropriateness and precision – internal validity – and a commitment to ensuring research addresses issues of application and real world or external validity* (Campbell & Russo (1999) cited in Duncan and Harrop, 2006).

There seem to be a *supply* side and a *demand* side influencing the emphasis on evidence quality and preparation of the evidence base. As described in Shaxon (2006) *supply side* is concerned with *credibility*, *reliability*, *objectivity* and *possibility of generalisation*. From the *demand side* more important issues are if the evidence is *policy relevant*, *timely enough* to inform or support decisions, *accessible*, *cost-effective* and *interdisciplinary*. There is a complicated relationship between the quality of evidence we input into the research and the quality of research we get as a result (Figure 6). Therefore we might say that final quality of research does not depend only on quality of evidence we input to that research.

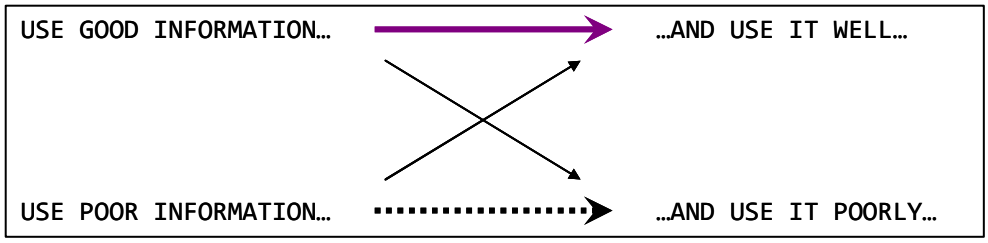


Figure 6: Relationship of evidence quality and research quality (adopted after Shaxon, 2006).

Management of environmental systems, such as catchments, relies partly on environmental data. This evidence is just one of the inputs in the decision making process (Dovers et al., 2001; Brown, 2004, cited in Brown et al., 2005) in spatial planning. Judging the credibility of decisions informed by evidence is essential to get the best value of the evidence use (Beven, 2000, cited in Brown, 2005). However, *sustainable and regenerated water catchments are the emergent property of social processes and not the technical property of an ecosystem* (Stayaert and Jiggins (2007)

cited in Ison et al., 2007). Moreover, *desirable water catchment properties arise out of interaction (engaging in issue formulation and monitoring, negotiation, conflict resolution, learning, agreement, creating and maintaining public goods, concertation of action) among multiple, inter-dependent, stakeholders in the water catchment*; i.e. *social learning* (Ison et al., 2007). Referencing back to definitions of what researchers, regulators and members of the public understand as evidence, we can derive descriptors of the quality of evidence (Table 3). Descriptors might be useful when attempting to capture and describe our opinion on what we think of quality evidence we either provide or use.

Table 3: Descriptors of evidence quality.

| QUALITY DESCRIPTORS | EXPLANATION OF THE DESCRIPTOR |
|---|---|
| **CLARITY** | the state or quality of being clear or transparent |
| **COHERENCE** | the quality or state of cohering, especially a logical, orderly, and aesthetically consistent relationship of parts |
| **SPECIFICITY** | the quality or state of being specific |
| **ROBUSTNESS** | ability to stand up to rigorous testing |
| **CREDIBILITY / RELIABILITY** | the degree of stability, predictability of evidence's "behaviour" under specific circumstances, the quality to be able to rely on; depend in achievement, honesty of evidence |
| **REPRESENTATIVE** | sufficiency to derive "sound" judgement, showing good judgement, able to be trusted |
| **METHODOLOGY'S INDEPENDENCY** | from wanted judgement or derived belief/opinion |
| **METHODOLOGICAL APPROPRIATENESS** | methodological suitability or fitting for a particular purpose, person, occasion |
| **PRECISION** | the degree to which the correctness of a quantity is expressed |
| **USABILITY** | capability of the evidence being used / fit for purpose |
| **PERSUASIVENESS** | the power of evidence to induce the taking of a course of action or the embracing of a point of view by means of argument |
| **REFLEXIVITY** | the extent to which the investigators have critically and explicitly reflected upon the methodological limitations of the research and the competing interpretations that may attach to the data |
| **AVAILABILITY** | in terms of actual existence and its economical sensitivity |

## 2.2 Reassessing the Aim and Objectives of the Study

Throughout the literature review the phenomena of WCS was thoroughly examined. A broad understanding about the origins of current evidence-based planning was established and presented from the point of view of sustainable water management for urban spatial planning. There are a few factors that seem important when addressing the WCS process today. The WCS process can be thought of as an interface between spatial planning and water management. From the literature review the actions resulting in WCS process can be identified, as well as the factors that might result from the WCS process. In some ways the literature review enabled an understanding of the interface between spatial planning and water management to be gained and thus helped to meet part of objectives of this research. However, it also created new questions therefore three points need to be reassessed at this phase.

*Firstly*, the literature did not provide a sufficient explanation of what is the specific contribution of the stakeholders in the WCS process and how do the stakeholders influence the preparation of the WCS the process – why is the process relevant to the quality of the WCS itself. *Secondly*, it was not clear what happens with the evidence in the process and why the WCS process is relevant to the future of evidence quality. And *finally*, it was not clear what the relevance of the WCS process is to sustainable development of urban areas and how far reaching the implications – if any at all – might be. It is in the interest of the author to answer these questions in the course of the research to be able to meet the objectives of the research presented in Chapter 1.

According to the reviewed literature it appears that quality of evidence might have a weight in the decision making processes of spatial planning, under The Planning and Compulsory Purchase Act, 2004, even though interpretations on the basis of incomplete evidence are possible. Therefore it is important to understand the relevance of the key-stakeholders involved in the WCS process. Literature also says decisions have to be made in light of available information (Duncan and Harrop, 2007). But is information good enough for decision making about sustainable water management for planned urban growth and does it have any other implications? Evidence weaknesses that exist

in the WCS process today can be explored by collecting opinions about quality of evidence used for preparing the WCS. Explicitly describing and documenting today's assumptions in the WCS studies might help to diminish some of the uncertainties and challenge our understanding of catchments as natural system in the future. However, the question remains if and how does this happens during the WCS process and what are the implications of thereof. These considerations are addressed through applying the research methodology as explained in the next chapter.

# Chapter 3: Research Methodology

*This chapter explains in detail the research design developed for this study. It states and justifies the rationale for development of this by considering five aspects: purpose, strategy, data type, data collection and data analysis. Details of precisely how the MK WCS case study was conducted in its first, second and third stage are given. Finally the quality of the research is considered, as well as a summary and conclusion given.*

## 3.1 Introduction

> *"The function of a research design is to ensure the evidence obtained enables us to answer the initial question as unambiguously as possible"*
> (de Vaus, 2001, cited in Bryman, 2007)

An outline of the research design is provided in Figure 7. A body of literature (Neuman, 1991 and 2006; Robson 1993 and 2002; Miles and Huberman, 1994; Bernard, 2006; Edwards, 1998) was drawn upon to develop the research design, through an appropriate combination of steps, to successfully address the aim and objectives of the research and to answer the research questions formulated (Robson, 1993) (Table 4).

| CONSIDERATIONS | OPTIONS |
|---|---|
| What is the **research purpose**? | Exploratory, Descriptive, or Explanatory |
| What should be the **research strategy**? | Survey, Experiment, or Case study |
| What **type of data** should be collected? | Qualitative or Quantitative |
| What sort of **data collection techniques** should be adopted? | Interviews, Checklist, Questionnaires |
| What **analysis approach** should therefore be used? | Coding, Clustering, Qualitative analysis |

Table 4: Research considerations made during the research design (adopted after Robson, 1993).

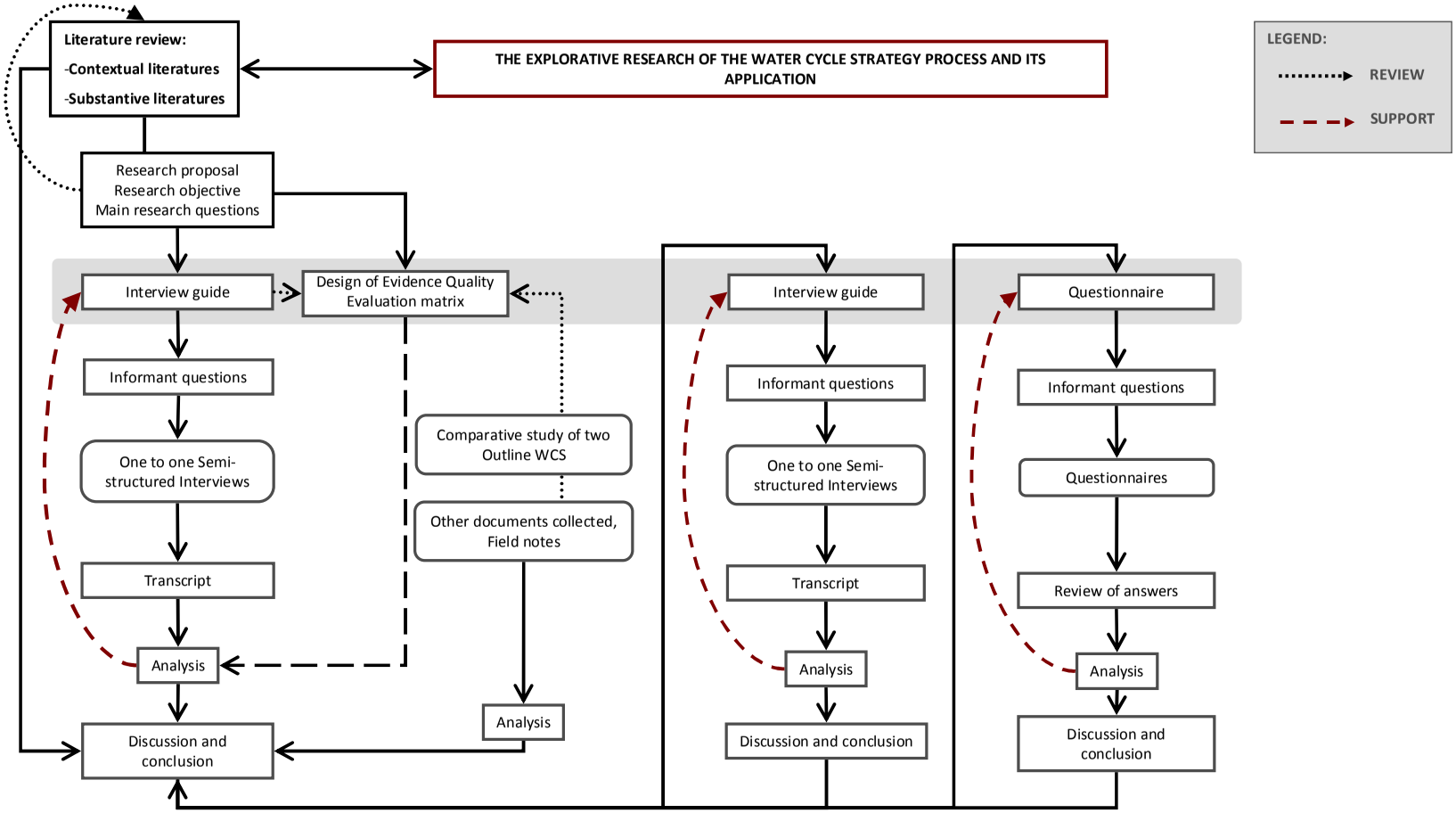


Figure 7: Overview of the research.

## 3.2 Research Purpose

Robson's (1993) classification of the purpose of enquiry was used to identify the purpose of this research (Table 5).

| | |
|---|---|
| EXPLORATORY | To find out what is happening. To seek new insights. |
| | To ask questions. To assess phenomena in new light. |
| | Usually, but not necessarily, qualitative. |
| DESCRIPTIVE | To portray an accurate profile of persons, events or situations. |
| | Requires extensive previous knowledge of the situation etc. to be researched or described, so that you know appropriate aspects of which to gather information. |
| | May be qualitative and / or quantitative. |
| EXPLANATORY | Seeks an explanation of a situation o problem, usually in the form of causal relationships. |
| | May be qualitative and / or quantitative. |

Table 5: Classification of the purpose of the research (adopted after Robson, 1993).

Very little is written about the process of the WCS process and its applications e.g. the relevance of the process in evaluating the evidence and its role in challenging the assumptions (both in science and planning). This study aims to critically assess the WCS process, thus its purpose is exploratory.

## 3.3 Research Strategy

According to Robson (1993) there is a common set of strategies used in relation to the research purposes described above. Robson's classification of research strategies was used to select the most appropriate strategy (Table 6). Case studies are more appropriate for exploratory work than other strategies, however it does not mean a case study can not be of a descriptive or explanatory nature (Robson, 1993).

| | |
|---|---|
| **CASE STUDY** | "A strategy of doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence". |
| **SURVEYS** | "Collection of relatively small amount of data form from larger number of individuals". |
| **EXPERIMENTS** | Assessing the impact of change due to manipulation of one variable or another. |

Table 6: Selection of the appropriate research strategy (adopted after Robson, 1993).

*Case studies can elaborate historical processes and specify concrete historical details* (Neuman, 1999). A case can be described as a particular phenomenon. Its study explores the phenomena within a context. There are several types of case studies. For instance illustrative, exploratory, cumulative and critical, and they can vary from an individual, to set of individual case studies; or from community studies to studies of roles and events (Case Studies; Accessed 2nd July (2008), Neuman, 1991). This research predominantly fits into the category of studies of organisations and institutions, with a focus on policy implementation, policy making, specific contributions of stakeholders, and policy reform. This case-based research followed a three-phased process as proposed by Edwards (1998) (see Thesis Structure, Chapter 1, Figure 1).

### 3.3.1 Research questions

It was concluded from the literature concerned with research methodology, that neither survey nor experiment would be appropriate for this research. The key selection criteria used to decide upon the research strategy were adopted after Robson (1993). Findings, from the review of literature and research objectives, were "translated" into three research questions, which formed the later research (Table 7).

| **RESEARCH QUESTIONS:** | | | |
|---|---|---|---|
| 1. What is the specific contribution of the stakeholder to the overall conceptual framework of MK WCS study and how does the process influence them? | | | |
| 2. What relations can be observed between the implementation of the WFD and the activities of the key – stakeholders involved in the MK WCS process? | | | |
| 3. How do the key – stakeholders perceive the quality of evidence that fed into the MK WCS process and what does the process mean for the evidence base? | | | |
| **STRATEGY:** | TYPE OF RESEARCH QUESTION | REQUIRES CONTROL OVER EVENTS | FOCUS ON CURRENT EVENTS |
| CASE STUDY | **How, what, why** | **No** | **Usually but not necessarily** |
| EXPERIMENT | **How, why** | **Yes** | **Yes** |
| SURVEY | **Who, what** | **No** | **Yes** |

Table 7: Research questions and types of the research strategy (adopted after Robson, 1993)

Even though the research questions are of an exploratory nature, it is demonstrated here that decisions over the research strategy were carefully considered:

a) There was no wish to control the events from the researcher's side. Nor this was possible. During the study it was necessary to understand the specific contribution of the MK WCS Steering Group to the overall MK WCS process. A case study was appropriate because stakeholders had to be observed in their "natural" environment.
b) The aim of the research was to gain in depth understanding of the MK WCS process. Even though this fact does not favour any of the available research strategies from the Table 7, specific "case event" calls for a case study.
c) It was expected that a considerable amount of data will be collected to describe the WCS process. At the same time, the number of individuals was limited only to stakeholders recognised as relevant for the WCS process, excluding survey and experiment as a strategic approach.
d) As Robson (1993) summarises, a case study allows for several data collection techniques to be utilised, e.g. observations, interviews and document analysis.

The type of thinking before and during the research corresponded to the "hourglass" notion of thinking, where research begins with broad questions, narrowed down to a particular case (MK WCS process) so as to observe it. This way data are gathered, analysed, and research conclusions are generated to generalise back to the original questions. This process can be described as deductive reasoning which at some point of research turns into inductive reasoning. In fact the two stages interacts and form a circular process so that final conclusions of the research can be made (Mailim et al., 1992). This theory was used while researching the MK WCS process.

### 3.3.2 Sampling strategy

Depending whether the research conducted is quantitative or qualitative in its nature, researchers can choose between two sampling strategies:

a) *probability sampling* that seeks for representative samples and accuracy or
b) *non-probability sampling* that focuses more on how a small sample represents social life.

Because this research deals with qualitative aspects of the MK WCS process, the focus was on non-probability sampling. Various sampling principles can be used in the non-probability sampling approach (Neuman, 1991). This study used a mixture of sampling principles, so as below (Table 8):

a) Firstly it used **purposive** (**judgemental sampling)** which is normally used to approach a highly specific population, or when research is concerned with a population's opinions and beliefs, i.e. MK WCS Steering Group (Neuman, 2006).

b) As research progressed and grew, the sampling approach changed to **snowball sampling**. The MK WCS Steering Group, and the relevant literatures, led the research to other stakeholders in the social and institutional network.

c) To provide a balanced and diverse view over the WCS process, the sample expanded as well to the academic population with help of **theoretical sampling**.

This way research included a particularly relevant sample that helped to reveal issues of theoretical importance for the WCS process.

| STAGE | SAMPLING STRATEGY |
|---|---|
| First stage | Purposive |
| Second stage | Snowball, Theoretical |
| Third stage | Purposive |

Table 8: Sampling used to sample the research population.

## 3.4 Data collection process

### 3.4.1 Type of data collected

Data gathered for this research is categorised as qualitative, in non-numerical form. These data differ from quantitative data, derived from numbers. *"In form of text, written words phrases, or symbols describing people, actions, and events in social life"* (Neuman, 1991).

### 3.4.2 Data collection techniques

> *"The selection of a method or methods is based on what kind of information is sought, for whom and under what circumstances .... there is a need to make some initial decisions ... However ... in flexible designs, the nature and the number of methods used can change as data collection continues"*
> Robson (1993)

To successfully assess the MK WCS process an appropriate data collection technique(s) had to be used. Research was divided in to three stages with each stage having its own purpose as detailed in Table 9 (Section 3.4.3). Analysis of first stage data occurred during the process and was crucial for the next stages. This type of research acquires

constant alertness and active exploration from the researcher. Data collection techniques, used for the study of the MK WCS process, were:

a) Semi-structured interviews

Semi-structured interviews are a good tool to systematically focus on the research questions and provide freedom in respect to the subject that is being researched in sense that the subject can be expanded as new issues arise. Questions can be changed during the interview, left out, or added, dynamics can be led which favours the richness of data obtained. The approach is useful at the analytical stage of research as new themes can arise, i.e. looking behind the curtain (Robson, 2002). The technique is based on pre-prepared interview guide and is an appropriate tool when expecting to get only one chance to interview someone (Bernard, 2006).

b) Direct (participant) observation and field notes

Despite several definitions to what direct observation is, the notion of *watching people and recording their behaviour through field notes* was adopted for this research (Bernard, 2006). We could argue that two different types of observation were used, depending on whether sample population knew it is being observed i.e. observing MK Steering Group stakeholders at an official meeting as opposed to observing delegates at CIWEM's conference. In the first case the researcher stayed nonreactive in observation not to affect the sample behaviour, while in the second, the researcher was also trying to get specific views from the stakeholders thus active participation was needed.

c) Structured Interviews

Unlike the semi-structured interviews, questionnaires belong to the branch of structured interviews where all the respondents are asked the same question in exactly the same way, through a sheet of predefined questions (Hague, 1993).

### 3.4.3 Data collection stages

Data collection continued as long as the analysis of previously collected data implied it should. The principle comes from grounded theory study (Robson, 2002). The population sampled is visualised in Figure 8 and described below.

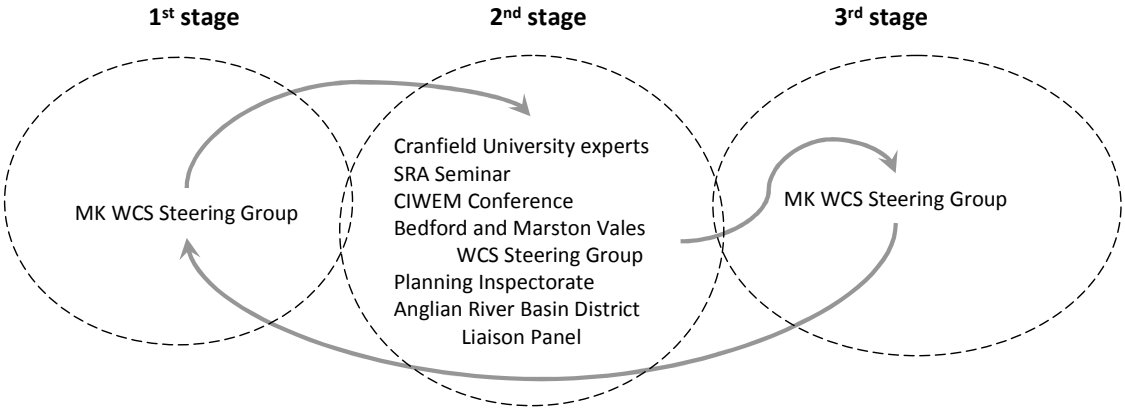


Figure 8: Data collection stages and the population sampled during the research.

#### 3.4.3.1 First stage

Semi-structured interviews were adopted to collect information from the MK WCS Steering Group (Appendix D). The nature and importance of different key-stakeholders of the MK WCS Steering Group demanded from interview questions to maintain relatively open ended and flexible. The identification of relevant key-stakeholders was straightforward i.e. stakeholders involved in the preparation of the Outline MK WCS. The preparation of the first interview guide (Appendix F), according to the research objectives and questions, followed after identification of the MK WCS Steering Group (Table 9).

#### 3.4.3.2 Second stage

Constant reading of literature, policies, documents and conversations with MK WCS Steering Group members opened new questions and broadened the sample of respondents on to different regulating institutions, working groups, academic staff and

the neighbouring LPA (snowball sampling). Research implied that a broader sample of respondents is needed to get the most balanced point of view on the quality of evidence used in the current spatial planning process and how this affects the WFD implementation. The broadened sample (Appendix D) was highly diverse and specific, thus two additional interview guides, according to sub-questions (Table 9), were created (Appendix G and Appendix H). For interactions with other second stage participants, direct (participant) observation and structured interviews (Appendix I) were utilised.

#### 3.4.3.3 Third stage

The first and second stage of research provides a reasonably good sample to represent the main characteristics the MK WCS process. However, findings implied that time is a relevant component when critically assessing the WCS process and that it needs to be explored what are its implications (Table 9). It was thus considered necessary to speak with members of the MK WCS Steering Group again after the Outline MK WCS has been completed.

Initially another round of semi-structured interviews was planned. But, because the semi-structured interviews took a lot of time, which some of the respondents resisted, the additional structured interviews were adopted (Appendix I). However, the researcher believes that this type of data collection technique was not sufficiently successful. The structured interviews from the second stage were as a data gathering technique more successful than those in the third stage. Even though some of the findings were useful at the end, the lesson was learnt that it would be better to stay close to the respondents and conduct face-to-face interviews.

| STAGE / RESPONDENTS / DATA COLLECTION TECHNIQUES | | AIMS |
|---|---|---|
| FIRST | **MK WCS Steering Group**<br>9 semi – structured interviews<br>Direct / participant observation<br>Field notes | • To gain an understanding of respondent's contribution to the WCS process and WCS influence on the respondents.<br>• To explore the activity of the stakeholders in respect to implementation of the WFD.<br>• To collect respondents' opinions on the quality of evidence that they use in the WCS process. |
| SECOND | **Bedford and Marston Vale WCS Steering Group**<br>Direct / participant observation<br>Field notes | • To observe the WCS process in the neighbouring LPA and compare it to the MK WCS process. |
| | **Cranfield University experts (SAS)**<br>8 semi – structured interviews<br>Field notes | • To further explore opinions on key-stakeholder's contribution and possible influence of the WCS process on their activities.<br>• To compare the views on key-stakeholders' activity in respect to the WFD.<br>• To gain scientific rather than practical views on evidence and to further explore the importance of the WCS process in respect to evidence quality in spatial planning. |
| | **Experts of various UK governmental organisations**<br>2 semi – structured interviews<br>Direct / participant observation<br>Field notes | • To further explore opinions on key-stakeholder's contribution and possible influence of the WCS process on their activities.<br>• To gain both practical and scientific views on evidence quality and to further explore the importance of the WCS process in respect to evidence quality in spatial planning.<br>• To gain an insight in contemporary debates concerning evidence quality in both social and natural sciences. |
| | **Anglian River Basin District Liaison Panel**<br>3 questionnaires | • To explore current ways of thinking in respect to how WCS process and WFD implementation may integrate in the future. |
| THIRD | **MK WCS Steering Group**<br>9 questionnaires<br>Field Notes | • To explore if social learning took place during the process and key-stakeholders acknowledge it;<br>• To check if the quality of evidence was improved with the process;<br>• To explore if it is in the power of WCS process to solve the evidence gaps;<br>• To explore the opinion about the relevance of the WCS to the RBMP; |

Table 9: Mixed data collection techniques that were used for the research.

## 3.5 Data analysis

Qualitative data were collected in the study to enable rich insights to be gained. According to Neuman (1991) "Q*ualitative data needs explicit and systematic step-by-step approach"* when analysing them. Long texts of transcribed interviews are awkward to handle and need to be organised in a way that makes the analytical process more transparent. This means that qualitative analysis, compared to quantitative, is less abstract than statistical analysis and closer to the raw data (Neuman, 1991).

Qualitative data – collected words – can often be *imperfect*, *imprecise*, and more or less *context-based*. One part of data analysis is indeed *finding patterns in data, analysing events and using models and diagrams to present the findings* (Neuman, 1991). This was achieved with the help of a coding system. However, sometimes information is hidden in a wider context thus special care needs to be put on evidence that is not there. Negative evidence is essentially a realisation in process that something is missing e.g. person you are interviewing is not entirely familiar with the details of subject in question and thus gives limited information (Neuman, 1991). Not only positive data, but also negative data led the research forward.

### 3.5.1 Coding and clustering

Codes are essentially sections of text of variable size that get tagged or labelled during the process of going through previously collected data (Miles and Huberman (1994), Neuman, 1999). This is an integral and common way of organising qualitative data which followed after the interviews were fully transcribed. Codes are used to rearrange collected information into *categories on the basis of themes, concepts or similar features*. The process of coding was guided by research questions and sometimes led to new research questions (Neuman, 1991).

The coding process helps us do two things. *Firstly*, it mechanically reduces the amount of data and places data into categories (Neuman, 1991). And *secondly*, it helps to search for synergies and conflicts. Literature differs between three types of coding – open,

axial (pattern) and selective coding. An example of adopted coding scheme is presented in Table 10 (Section 3.5.1.1). To better understand different types of coding an explanation adopted after Neuman (1991) is provided in the next section.

#### 3.5.1.1 Types of coding

a) **OPEN CODING** is performed during the first pass of collected data as a first attempt of clustering data into categories. Themes are broad and connected with initial research questions. End list of themes serves three main purposes: (a) to show emerging themes quicker, (b) to encourage search for new themes in future research, and (c) to help build a list of all themes that can later be extended, organised, combined, discarded or otherwise analysed.

b) However, **AXIAL CODING** that follows presents a second pass through the data and it focuses more on previously selected themes than on actual raw data. The focus is on reviewing initial codes and building the axis of key concepts. It is about deriving sub-themes or sub-categories. The main question arising during the axial coding should be cases and consequences, conditions and interactions, strategies and processes, or categories and concepts that can later be clustered together.

c) **SELECTIVE CODING** that follows focuses on organising analysis around core ideas, e.g. what role does the perceived quality of evidence have in future policy making process; or should spatial planning as a political process be regarded as a an interface in managing cumulative environmental effect.

| OPEN CODING | | PATTERN CODING |
|---|---|---|
| **f (S)** | Stakeholder function as the overall aim of the organisation | SociEduCultural fole<br>PublicSafety<br>Production<br>Ecolog<br>MaxMultifunctBenefit<br>Tool |
| **f (S MK WCS)** | Stakeholder function within the MK WCS study | MaxMultifunctBenefit<br>Tool<br>StratFrwdPlanRole |
| **SIP – MK WCS** | Stakeholder Interest and Power over specific research question within the MK WCS study | LandOwner<br>ManagementMaintenance<br>ForwardPolicyMaking<br>NoStatutoryObligation<br>NonEngineeringEsxpertise<br>ComplianceWFD<br>LocalKowledge |
| **SMon – MK WCS** | Stakeholder monitoring system to support their interest within the MK WCS study | NoMonitoringStatus<br>PosibeleFutureMonitoring<br>ExperienceKnowledge |
| **SL - WFD** | Stakeholder's legal responsibility or general attitude over the implementation of the WFD | GeneralResposibility<br>ActResposibly<br>ProtectPromote<br>PrimaryPuclicAcessAmenity<br>SecondaryWldlifeWater |
| **SA MK WCS – WFD** | Stakeholder's activity in implementation of the WFD through the MK WCS | GeneralResposibility<br>ActResposibly<br>ProtectPromote<br>ManagingArtificialBodies<br>Maintenance&Liability |
| **S EI** | Stakeholder's evidence input | NoEmpiricalStructuredEvidence<br>LimitedEcologicalSurveys<br>ExperienceKnowledge<br>SocialBenefit |

Table 10: Example of the coding system that was adopted after analysing the interview with the Milton Keynes Parks Trust.

### 3.5.2 Grounded theory

This research followed the principles of grounded theory as described by Edwards (1998). The coding just mentioned is typical in grounded theory studies described in several literatures, for example Robson (2003) or Edwards (1998). The theory defined by Glaser and Strauss in1967 is cited for example by Cook (2003) as followed below:

*"The process of data collection for generating theory whereby the analyst jointly collects codes and analyses his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges."*

The key point here is that the research stays with the material or theory remains close to the data. After identifying the central phenomenon, coding helps the researcher to identify the causal conditions related to the central phenomenon, identify interactions resulting from central phenomenon and finally identify what outcome these factors have on central phenomenon (Figure 9) (Robson, 2003).

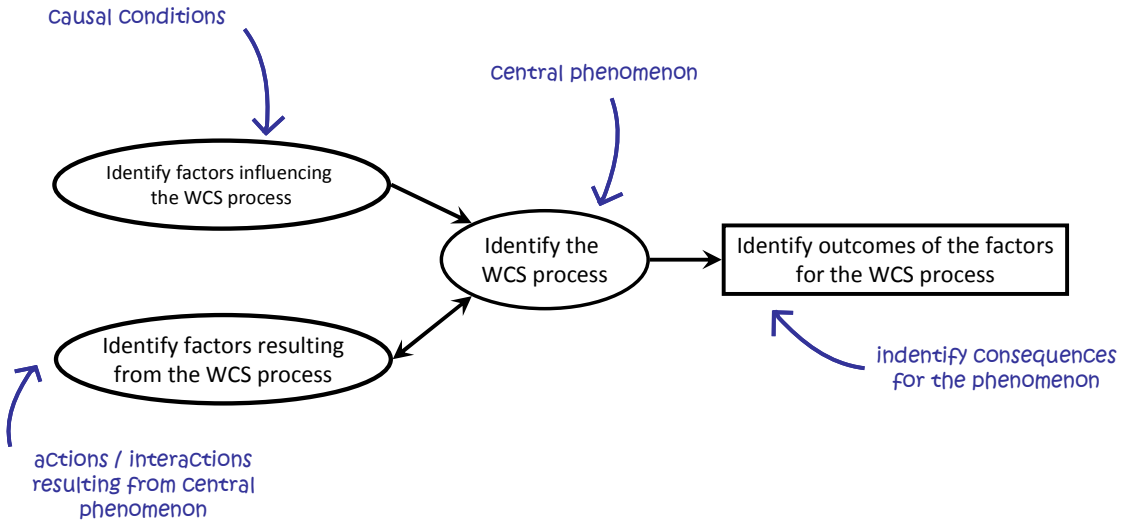


Figure 9: Features of grounded theory (adopted after Robson, 2002).

## 3.6 Research design quality

The establishment of trustworthiness is a major issue for research design (Robson, 1993). This means that emphasis was made to ensure that research quality standards are met throughout the literature review and consecutive phases of this research. The need for Construct validity, External validity and Reliability were the main considerations when seeking research quality in this study. This approach was followed after Cook (2003) (originally adopted after Yin, 1994) and was used as a check list in relation to the research quality of this thesis. From a simple check list, Table 11, it can be seen that most of the steps that contribute to better research quality were utilised in this research.

Table 11: Check list of research quality (adopted after Cook, 2003)

| Requirement for research design validity | Method utilised | Check list |
|---|---|---|
| **Construct validity** Establishing correct operational measures for the concepts being studied. | Multiple sources of data and collection techniques. | Yes |
| | The findings from case study research were reviewed by participants. | Partly |
| | The refined conceptual framework was reviewed by participants and also individuals from a range of related background; outside the case study area. | Yes |
| **External validity** Establishing the domain to which a study's findings can be organised. | The notion of selecting multiple case studies that were thought to replicate findings was utilised. | Yes |
| **Reliability** Demonstrating that the operation of a study such as data collection procedures can be repeated. | The case study methodology was embraced. | Yes |
| | Data was collected in a rigorous manner. | Yes |
| | Findings were tabulated with reference to source. | Yes |
| | The sources of information were outlined. | Yes |
| | A thorough understanding of the background literatures was obtained. | Yes |
| | Project aims and objectives were identified and clearly stated. | Yes |

## 3.7 Conclusions

Throughout the chapter the views from several sources of literature were presented by which the steps undertaken during the research were supported. Having defined and justified the research purpose, research strategy, type of data collected, data collection techniques used and analysis approach undertaken, Table 12 summarises the research design developed for this research.

Table 12: Review of the research design (adopted after Robson, 2002).

| CONSIDERATIONS | Methodological approach chosen |
|---|---|
| What is the **research purpose**? | Mainly Exploratory |
| What is the **research strategy**? | Case study |
| What **type of data** will be collected? | Qualitative |
| What sort of **data collection techniques** will be adopted? | Semi-structured interviews, Field-notes, Questionnaires |
| What **analysis approach** will be used? | Coding, Clustering, Qualitative analysis |

In Chapter 4 the methodology utilised in the research was described. Detailed description is provided on execution of sampling strategy and data collection. Furthermore the aims for data collection under each of three stages of data collection are provided so as the data collection techniques and adopted coding system. An additional overview of the research methodology, which gives an insight to inter-connections between different stages of the research, is provided at the beginning of the Chapter (Section 3.1, Figure 7). In the following chapter the findings of the research are presented.

# Chapter 4: The research findings

*The thesis findings are reported in three sections, according to the data collection stages, and research questions and sub-questions. At the end of this chapter the summary of findings can be found. The findings are further discussed in Chapter 5.*

From Figure 10 it can be visualised how data collection stages were organised according to the research questions and sub-questions formed during the research. The research questions and sub-questions were needed to provide insights into a very complex process in spatial planning and its relevance to the WFD through WCS process and thus meet the aim and objectives of this research.

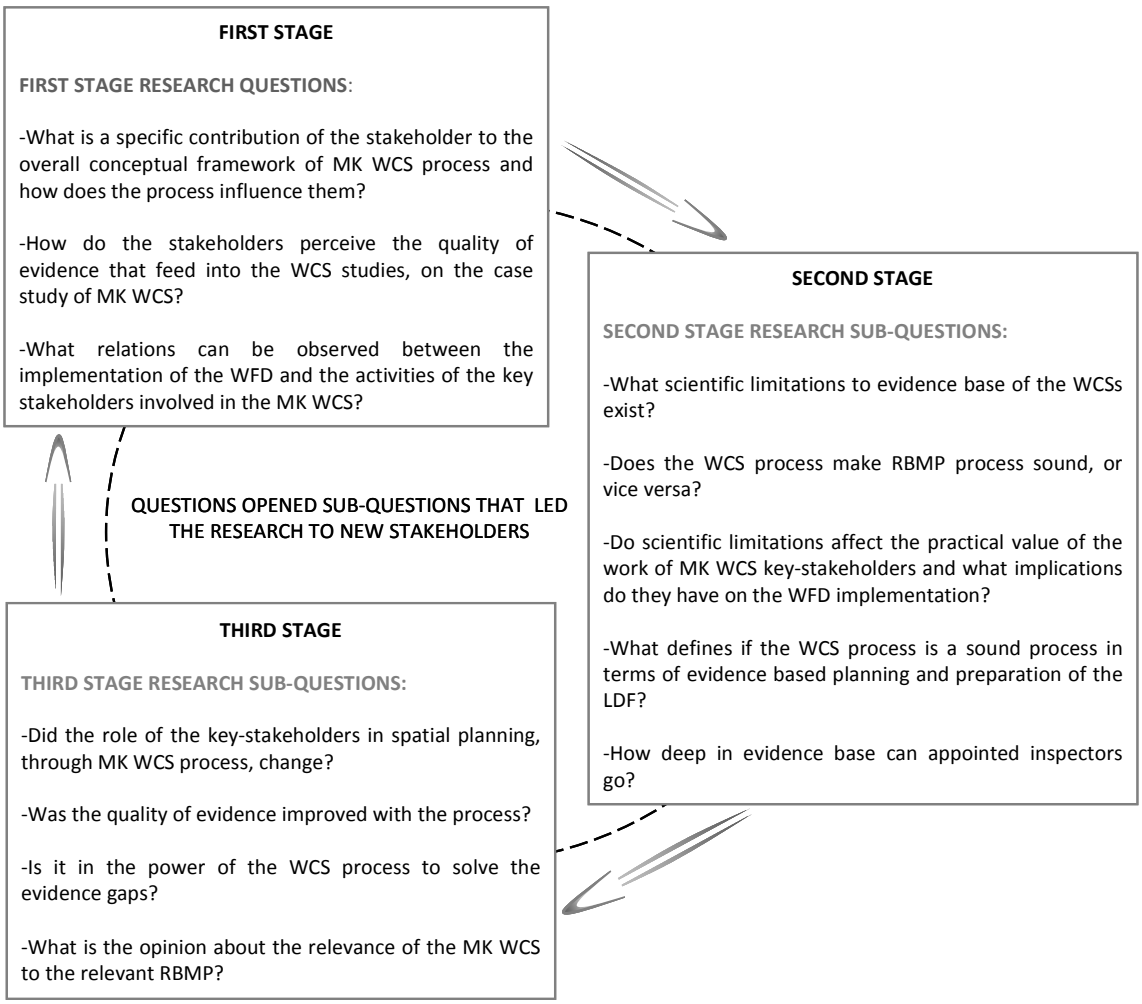


Figure 10: Thesis findings are organised in relation to the research questions and sub-questions formed during the research.

## 4.1 Findings from the first stage

### 4.1.1 Introduction

This section presents the findings of the first two rounds of data collection. The first stage of data collection involved the use of semi-structured interviews with the Steering Group working on the MK WCS. Milton Keynes, where the study was located, is a city in South-East England planned to grow (more on the case study area can be found in Appendix A) (Figure 11). A visualised WCS process as observed in practice during the research is shown in Figure 12.

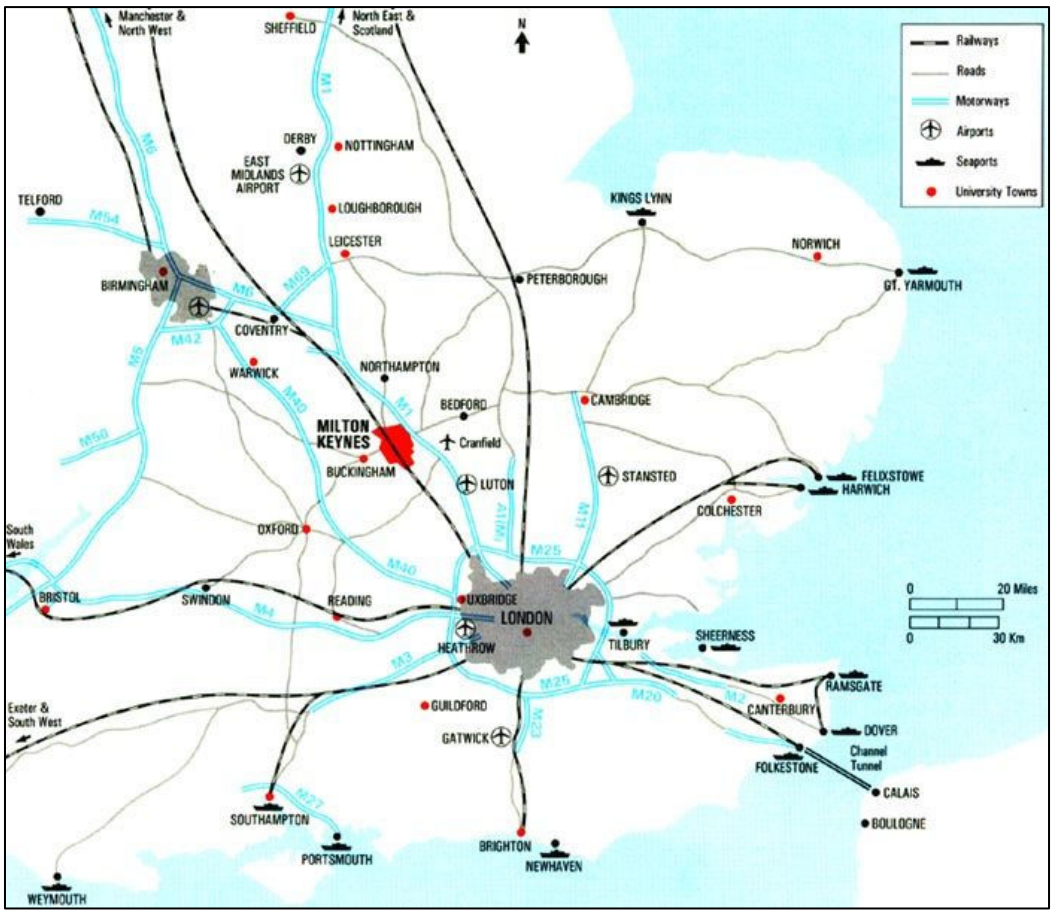


Figure 11: Location of Milton Keynes (Milton Keynes – MKWeb Home Page – MKWeb, Accessed 26th August, 2008).

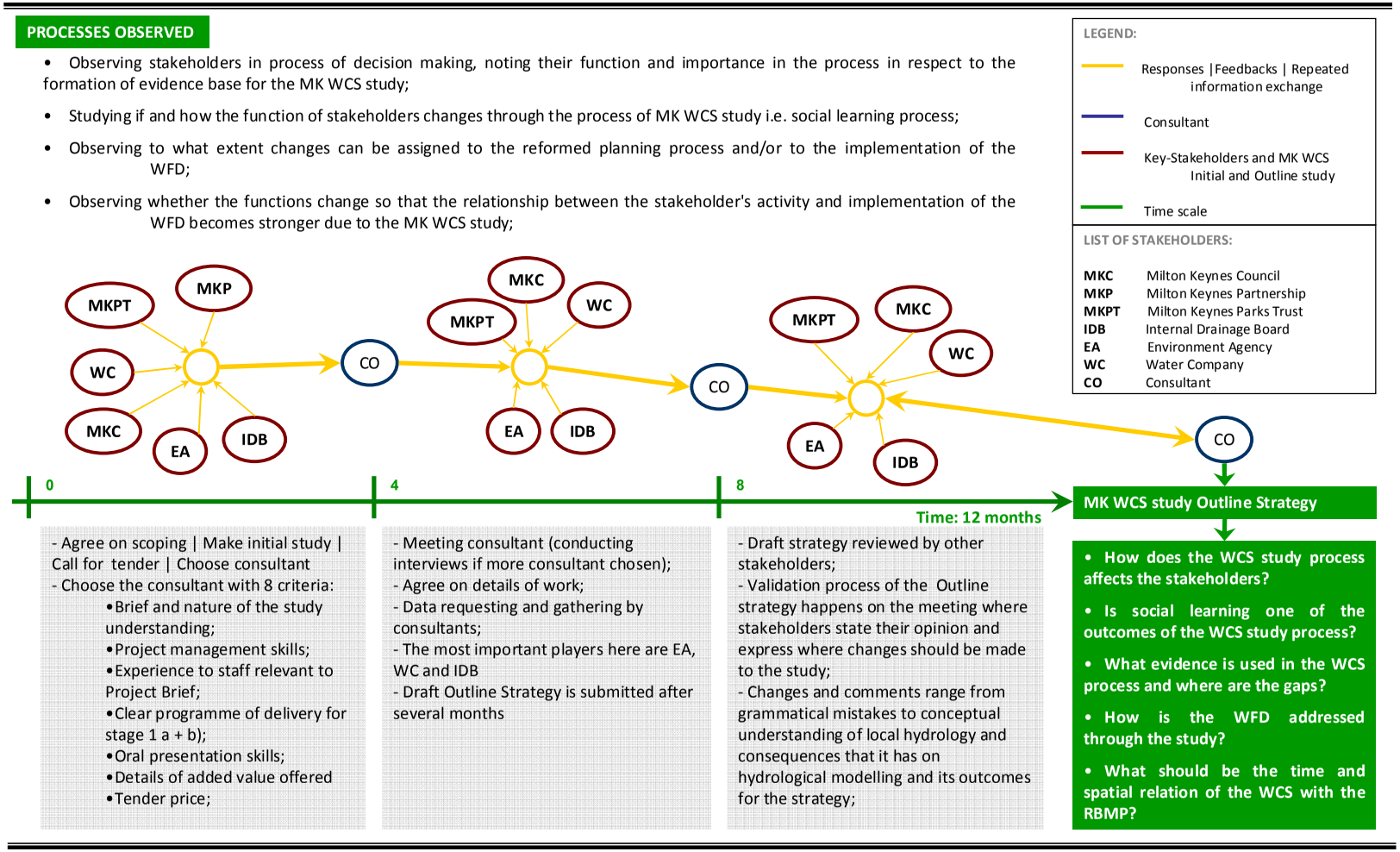


Figure 12: Diagram of the participative planning process within the MK WCS process.

Data collection indicated there are eight different but interrelated themes, joined in three clusters (Box 3). These were used as basis for analysing stakeholders' roles in, and opinions about, the implementation of the WFD through the evidence-based spatial planning process.

Box 3: The three clusters of first stage of semi-structured interviews with seven emerging and dominating themes.

**Exploring and defining specific contribution of the key-stakeholders to the overall conceptual framework of the MK WCS study**

**STAKEHOLDER'S:**

- Function as the overall aim of the organisation;
- Contribution / function within the MK WCS process; and
- Drivers of interest in the MK WCS process.

**Relations observed between the implementation of the WFD and the activities of the key-stakeholders involved in the MK WCS study**

**STAKEHOLDER'S:**

- Legal responsibility / general attitude over the implementation of the WFD through MK WCS study and connected urban growth;
- Activity in implementation of the WFD through the MK WCS process; and
- Activity as a response to the WFD.

**Perception of the evidence quality by the key-stakeholders**

**STAKEHOLDER'S:**

- Monitoring system to support their interest within the MK WCS process; and
- Evidence quality and role in decision making.

### 4.1.2 Main points

**Exploring and defining the specific contribution of MK WCS key-stakeholders to the overall conceptual framework of the MK WCS process**

**STAKEHOLDER'S:**

- Function as the overall aim of the organisation;
- Contribution / function within the MK WCS process;
- Drivers of interest in the MK WCS process;

**Overall function and contribution / function within the MKC process**

The MK WCS process is forward-looking in nature and concerned with policy development. From its scope, it is evident that the MK WCS is focusing on long-term effects of spatial planning (urban growth) on water management, and to some extent changes of human behaviour towards efficient water use (Water Services Infrastructure Guide, 2008). Challenged and motivated by the EA, the LPA and other stakeholders are encouraged to use spatial planning process to combine the good status of waters with urban growth.

There is no statutory obligation for LPAs to undergo the WCS process at present. However, because the WCS studies are so specific to planned growth areas (under the government growth agenda), the EA advises to take the WCS process into account. The same was confirmed by the representative of the EA:

> *(…) It's not as you know a statutory requirement yet, although clearly the new policies in the RSS say that they do refer directly to the new WCS studies and the need for them to be undertaken. So that's good news for us, but it's not a statutory requirement … we've had some discussions with the local authorities to get them to accept our position and that's important piece of work (…)* (Respondent A8)

The MK WCS process was set up as an interdisciplinary and cross-sectoral study with an appointed Steering Group (Table 13). In theory, and as shown in practice, this means

the experts and the policy-makers communicate directly or indirectly to agree on a set of research questions relevant for the WCS. This is followed by responses and feedbacks, and repeated information exchange through the process of WCS preparation, to finally produce a judgement in a form of a high level strategic plan. From the research, the most dynamic parts of the process were found to be responses and feedbacks and repeated information exchange. It is where the most conflicting interests meet and the most compromises are made (Figure 11).

For instance, the MK WCS key-stakeholders were asked to describe the overall aim of their organisation and how the overall aim feeds into the MK WCS process. As it can be clearly seen from the responses the roles are very different. Moreover functions differ due to the fact that the WCS studies are in their nature regarded as highly technical documents. Meaning, not everybody can play the same role over every research question in the Steering Group. The Steering Group is a suite of organisations from public and private sector (Table 13). Public sector present MKP, MKC, MKPT, IDB and EA; on the private side there are WC and CO. There is a clear delineation what particular organisation does and what is its role in the Steering Group, however functions overlap.

| PUBLIC ORGANISATION | PRIVATE ORGANISATION |
|---|---|
| Milton Keynes Partnership (MKP) | Water company (WC) |
| Milton Keynes Council (MKC) | Consultant (CO) |
| Milton Keynes Parks Trust (MKPT) | |
| Internal Drainage Board (IDB) | |
| Environment Agency (EA) | |

Table 13: Organisations involved in the MK WCS Steering Group.

Functions / contributions of key-stakeholders as were observed through the semi-structured interviews were:

- funding (MKP, MKC, EA);
- strategic planning role (MKP, MKC, EA, WC);
- organisational role (MKC),

- purely engineering, modelling and advising role (CO, WC, IDB);
- data sharing role (WC, EA, IDB);
- consulting on the maintenance of blue-green areas, landscaping and combined benefits of maintaining the designated flood areas with wider ecological and social benefit (MKPT, IDB);
- process evaluating role (WC, EA).

Here is how MKC representative explained their organisational role:

> *"(…) its very much about sharing the information. I get less involved with the technical side of things. My role is to make sure that the right people are talking to each other … I head up an environmental team of stakeholders around the table and its role is to identify where the problems are and try and unblock barriers to the delivery. So I chair that team (...)"* (Respondent A4)

Or an example of how the EA representative on another occasion explained their data sharing role and, to them very specific, partnership approach:

> *"(…) But from the day one we've always made it clear to local authorities and LDVs that we will work in partnership with them, we will make the information available, we will make the data available which if they were charged with the commercial rate that would be considerable. So we've made the data available (…)"* (Respondent A8)

**Drivers of interest in the MK WCS process**

MK WCS Steering Group members stated different drivers of interest for participating in the MK WCS process. Partnership oriented strategic planning, driven by EA, is the main goal of the Steering Group. Every key-stakeholder involved felt responsible for the development in a sustainable manner however reasons for working in partnerships were different. Responses show there were various drivers behind the interests of organisations involved in the MK WCS process.

Main drivers of interest for participating in WCS process and the MK WCS Steering Group are:

- Landownership (MKC, MKP) and maintenance of green infrastructure and local water bodies (MKPT, IDB);
- new market (CO, WC);
- sustainable growth (all partners);
- governmental growth agenda (EA, MKP, MKC);
- timely policy delivery and compliant LDF (MKC) – relation to reformed spatial planning;
- defining physical limits to growth considering the environmental aspects;
- creating evidence base for different purposes like business plan, delivering implementation, managing developers, sound spatial planning etc. (WC, MKC, MKP, EA);
- education (EA).

For example the main driver for CO is a potential new market:

> *"(…) The interest of (Consultant) in the WC strategies is really I think because of the, not just because they're new, but because of the potential new market (…)"* (Respondent A2)

Interest of the MKC is not only in minimising and avoiding possible detrimental environmental effects of growth, but also gives way to the reformed planning system i.e. solve problems and plans actively as opposed to reactively:

> *"(…) Under the new forward planning regime planning documents are expected to be more accurate, more precise and more certain. Partly because of the amount of evidence behind them which are feeding into them, like the WCS process. They should be more robust, deliverable, and have clear implementation chapters how and when and who will provide the infrastructure and the development planned in those documents (…)"* (Respondent A5)

The main interests from WC are new customers and approved AMP. The WCS serves as a support document to justify the company's investment plan:

> *"(…) The WC as a company wants new customers, and they want to see the development happen. They don't want to be a constraint to the development … We work with them closely, making sure we flag up issues about pollution, sensitivity of the water course, flood risk, environmental sort of ecological, triple S I, biodiversity and all that kind of thing (…)"* (Respondent A9)

> *"(…) We have to submit new Business management plan which is a periodic review, in 2009. And that would be for 2010-2015. So basically if there's an asset that we need to upgrade or replace within their period, we have to go to Ofwat now really to say we need this money to upgrade, for example strategic mains (…)"* (Respondent A9)

It was observed that as the WCS progresses it changes the importance of some of the stakeholders and thus creates new interests in the WCS process i.e. stakeholders become more crucial or their role becomes clearer. However, because the WCS is a process, time was needed to confirm this observation throughout the process and establish how relevant is the WCS process for the future responsibilities of different key-stakeholders. However, first implications were gained from Respondent A1, which was recognising that their role in decision making is changing and that they are becoming increasingly important in terms of implementing the qualitative future growth:

> *"(…) We're increasingly becoming a part of strategic planning stakeholder group, strategic forward planning role (...) in the WCS process a very high proportion of that land is important in terms of water management, flood management, partly SUDS (…)"* (Respondent A1)

## Relations observed between the implementation of the WFD and the activities of the MK WCS key-stakeholders involved in the MK WCS process

**STAKEHOLDER'S:**

- Legal responsibility / general attitude over the implementation of the WFD through MK WCS process and connected urban growth;
- Activity in implementation of the WFD through the MK WCS process; and
- Activity as a response to the WFD.

Another question that was important to explore was the relationship between activities of stakeholders in relation to the implementation of the WFD, during the WCS process. This was important to explore fully how findings from literature review correspond to actual practice in spatial planning. Key-stakeholders do have different knowledge about the WFD. They felt different responsibility for its implementation as well. During the research it was found that there are two aspects of responsibility in relation to the implementation of the WFD through the WCS process: legal responsibility and devolved responsibility. As much as these two attitudes have different meanings, they can overlap.

The findings have identified two groups of key-stakeholders in respect to the implementation of the WFD:

- For implementation legally responsible members of the Steering Group (EA); and
- key-stakeholders with devolved responsibility (all the other members of the Steering Group).

Within the group with devolved responsibilities there are:

- stakeholders that do not feel this responsibility and distance themselves from commenting on the WFD (MKP);
- stakeholders who feel the pressure of implementation (devolved responsibility), but report lack of clarity to what the activities should be (CO, MKPT, MKC, IDB); and

- stakeholders expressing their proactive interest in implementation of the WFD and cost-benefit considerations made in relation to it (WC).

For instance MKP still thinks there is no real correlation between the WFD implementation and their activity, even though they are co-funding the WCS process which is clearly connected with the WFD:

> *"(…) I don't think I know enough about the WFD to answer that question really. It's sort of outside my field really. It's EU legislation … our work is kind of top level over and above day job of driving up the housing and employment numbers (…)"* (Respondent A9)

MKC reports on lack of clear responsibility over the WFD implementation in the future, however sees importance of the WCS process in relations to delivery of the WFD objectives:

> *"(…)There is no statutory obligation but there is an expectation that local authorities take on the responsibility of doing that … there should be a more clear role in the future (…)"* (Respondent A4)

Especially the WC, as a water company, is actively undergoing the cost and benefit considerations of the WFD, however in the WCS process they are not undertaking an integrated approach to the implementation but more generic "few phrases" approach:

> *"(…) Yeah, WFD is going to have a pretty significant effect we believe in what investment requirement we're going to have … at this stage we don't really know to what extent …. So, at the moment it's the thing we'd wanted flagging up in the WCS process as sort of generally a standard, few phrases or a paragraph. Explaining it's coming in and it's going to have an impact (…)"* (Respondent A9)

Interviewee from WC on this and several other occasions expresses the influence of the WFD on their work:

> *"(…) The WC as a company wants new customers … They don't want to be a constraint to the development, and also as a responsible company we want to protect the environment … flag up issues about pollution, sensitivity of the water course, flood risk, environmental sort of ecological, triple S I, biodiversity and all that kind of thing. (…)"* (Respondent A9)

Especially the opinion before the last summarises the importance of the WFD in the WCS process – it is not clearly defined. Because the implications are not clear at the moment, officially only a standard few phases are needed in the WCS.

## Perception of the evidence quality by the key-stakeholders

**STAKEHOLDER'S:**

- Monitoring system to support their interest within the MK WCS process; and
- Evidence quality and role in decision making;

The third enquiry that was important to assess was the perception of evidence quality that is being used in the WC process so that relevance of evidence quality in evidence-based planning could be assessed. Because word "evidence" constitutes almost anything, similarly "quality", the perceptions of stakeholders were important to gather.

Common questions given to the respondents were concerned with their evidence input and their opinion about its quality. A simple matrix (provided in Appendix I), created from the notions evidence and quality, was used to gain opinions from the key-stakeholders. The matrix was used to focus the respondent on particular evidence at a time only.

During the interviews, the following stages – which prepared the respondents to give their view about the evidence input during the MK WCS process and the evidence quality – were done:

- explain to the respondent why interest in the quality of evidence;
- question respondents on their evidence input in the WCS process;

- provide respondents with a list of definitions to what constitutes as evidence (the definitions were elicited from the literature review);
- provide respondent with a list of descriptors which could be used as adjectives to describe quality of particular evidence;
- provide respondents with evidence quality evaluation matrix;
- evaluate quality of evidence by gathering respondents' opinions.

MK WCS presents evidence that gives the LPA:

**a)** High guarantee that the local planning permissions will be approved by the Environment Agency;
**b)** defendable LDF during the process of independent examination;
**c)** greater assurance that development is planned in a more sustainable manner; and
**d)** evidence that can be put in front of the developers in terms what is expected from newly developed sites.

As MKC representative explained in the course of the interview, the main advantages of the WCS process is that it enables the new developments to meet certain standards set down in planning policies:

> *"(…) the WCS will give us the evidence, detailed information, to allow us to impose growth standards and planning policies on future developments. It's to help us to have the evidence to persuade developers and ultimately the government or inspector appointed by the secretary of state and that our policies are robust, reasonable and deliverable (…)"* (Respondent A5)

Several views were gained about the quality of evidence in use during the communication with the MK WCS Steering Group. The respondents listed three factors limiting the quality of evidence (which can overlap):

(a) commercial sensibility (e.g. discussion about water pricing in relation to quality of monitoring of water consumption by WC);

(b) safety issues (e.g. location of water infrastructure in relation to national safety issues);
(c) lack of monitoring (e.g. lack of monitoring in relation to ecological benefits of maintaining parks by MKPT);
(d) time gaps (e.g. gap in planning for development without relevant RBMP).

**Monitoring system to support their interest within the MK WCS process and evidence input**

Before the findings about the changing quality of evidence are explained, it is important to state what kind of monitoring programmes the key-stakeholders have. Organisations are either with or without recorded data of changes or relevance of their activities, thus either with or without the monitoring systems:

- stakeholders with official network for environmental monitoring (EA, partly IDB)
- stakeholders with their private environmental monitoring programme (WC)
- stakeholders monitoring demographic change through environmental / spatial policy (MKC, MKP)
- stakeholders without any specific monitoring programme (MKPT, CO)

WCS evidence inputs are highly connected with monitoring status and current role of the stakeholders. For instance MKPT as an organisation does not do any monitoring in the classical sense, yet still their activities are expected to contribute, to for example, an increase in biodiversity:

> *"(…) Trust has no specific empirical evidence to offer into the process. On a few areas of our land we have carried out ecological surveys and monitored for certain species, although obviously that is quite restrictive (…)"* (Respondent A1)

On the other hand EA provides all environmental data (such as LIDAR data, maps, information about volumetric capacities of rivers and local geography), together with data from WC:

> *"(…) it's part of comprehensive amount of data, we make it available in this all sort of collective through out national head office near Bath … which we use internally. So the planning applications that come in we use that information, so the specific information we frequently use (…)"* (Respondent A8)

**Evidence quality and role in decision making**

From the responses several points about the evidence quality could be outlined. Findings are connected both with the activity of the MK WCS key-stakeholders, monitoring systems in place, changing relevance of the stakeholder and practical use of evidence.

1. KNOWLEDGE: In the course of the MK WCS process, not all key-stakeholders can evaluate all evidence feeding into the study. For example: EA & IDB can comment on SFRA because they understand the details of the methodology behind it. Additionally IDB has local knowledge and experience and thus can evaluate if the model used for SFRA is either overestimating or underestimating the behaviour of water bodies.
2. CHANGES IN THE QUALITY: It was observed that quality of evidence is changing during the process of making the MK WCS process due to cross-sectoral communication. This observation was made during observing the process and was confirmed by respondents (example: SFRA before and after consultation with IDB).
3. NEED FOR MONITORING: The MK WCS process flags up the need for additional or changed monitoring schemes in relation to some of the organisations involved in the WCS process. For instance, MKPT believes that if standards of maintenance are introduced, the liability question of system maintenance is important for them to be answered (standards to maintenance of SUDS i.e. *"we have to know they are working properly form the beginning"*). So far their work has not been done

according to pre-stated standards. Meaning standards of maintenance of green areas and flood plains were in their own domain.

4. TIME: definitions of quality and evidence shows there is a time factor involved when the evidence quality is assessed in the process. It appears that time defines the quality of decision and the number of assumptions they have to make.
5. EXPECTATION: expectation of certain outcomes influences the opinion about the quality of evidence. For example IDB representative expected more from the SFRA than the outcome was.
6. EVIDENCE IS CONTEXTUAL: respondents take the use-oriented view during the interviews e.g. *"it's the best we have"* – this confirms that quality is contextual;
7. WILLINGNESS TO JUDGE THE QUALITY: willingness to evaluate quality is connected with the knowledge behind how evidence was created, and the responsibility the stakeholder thinks it has in the group.
8. The perception on what is evidence depends on what is the purpose of evidence and who is dealing with it. Example: For CO evidence is flooding zones while for independent planning inspector evidence in this case would be the SFRA. However, in respect to how deep and precise it is possible to inspect/build the evidence base, for both the planning inspector and the CO it applies the same:
    - It depends on the scale of the plan. Bigger the scale more detailed the inspection/gathering of the evidence can be.
    - Quality of the evidence base changes during the process. While CO is very exposed to changes during the process the planning inspector does not see the process of evidence valuation during the process because of its irrelevance for the examination;
    - They both use the principle of proportionate evidence (the first is commercially dependent on this principle, the second does not really care, as long as sufficient evidence base was created);
9. EVIDENCE-BASED PLANNING: connotation used in the process that promises the key-stakeholders used the best evidence available. Connotation only does not already present a fact.
10. WFD and evidence: including the WFD aspirations increases the unknowns about the evidence base more than it diminishes it.

11. INTER-SECTORAL COLLABORATION: even though the consultants are trained to deal with data in a sensible manner the local experts are needed. The latter critically evaluate some of the (un)tested assumptions on which the consultants base their decisions on. Example: IDB commenting on negative impact of chemical status of Ouse on Ouse Washes as untrue.

Generally members of the MK WCS Steering Group are confident with the evidence they use. However they realise there are limitations, mostly connected with:

- modelling climate change within SFRA,
- uncertainties about the future water quality standards and connected investments in waste water treatment works,
- lack of concise monitoring (as case of MKPT),
- uncertainties about behaviour of pollutants from diffused source pollution.

**Limitations of the MK WCS process in terms of sustainable water management that were recognised are:**

- MK WCS process fails to combine the effect of land use and urban impact on water environment, by separating urban, industrial and agricultural water use. The problem occurs with point source and diffused source pollutions – should WCS therefore take into account also the land use within the catchment?
- There is not clear integration of RBMP and WCS processes, even though they are both spatial plans, and MK WCS is located within the boundaries of the RMBP. How will these two integrate in the future?
- Evidence limitations in some instances affect the quality of the MK WCS process – is the WCS process strong enough to resplve the monitoring limitations and improve environmental monitoring so as it is being done in the frame of the WFD?

The limitations of the MK WCS process above formed research sub-questions, broadening the research sample on the other stakeholders, in the second stage of the research. Report on findings of the second stage thus follows.

## 4.2 Findings from the second stage

### 4.2.1 Introduction

Observing key-stakeholders of the MK WCS Strategy provided a valuable insight in how the stakeholders interact, if and how the process of the WCS affects them and their opinion about the quality of evidence they use. Few limitations of the WCS as a process were identified in the first stage. To provide a balanced practical and scientific view of evidence quality and its relevance to decision making in practice it was necessary to include a broader sample of respondents. In the second stage the data collection included the data collection techniques and a sample of respondents as laid out in Section 4.3.3, Table 10. Findings from the second stage of interviews are set out in Box 4. A few suggestions that were important to carry from the first to second stage and explore during the data gathering were:

- What scientific limitations to the evidence base of the WCSs exist?
- Does the WCS process make the RBMP process sound, or vice versa?
- Do scientific limitations affect the practical value of the work of MK WCS key-stakeholders and what implications do they have on the WFD implementation?
- What defines if the WCS process is a sound process in terms of evidence based planning and preparation of the LDF? How deep in to the evidence base can appointed inspectors go?

**Box4: Organisation of findings of the second stage semi-structured interviews**

**Catchment approach in sustainable water management for urban growth**

**Integration of RBMP and WCS process**

- Relevance of the WCS process to RBMP; and
- soundness of the LDFs and evidence gaps.

### 4.2.2 Main points

**Catchment approach in sustainable water management for urban growth**

WFD aims for a higher standard in sustainable management – however many of respondents adopted the opinion that good ecological status is not well enough defined and that some of the WFD implementation has so far been due to lack of political power:

> *"(…) It's a very challenging directive, from a technical point of view the chemical parameters are quite important, but the WFD takes us beyond – it requires good ecological status (…)"* (Respondent B11)

> *"(…) The problem is more in constructing the definition of good ecological status and then translating that into something you can measure in the river potentially (…)"* (Respondent B20)

> *"(…) Catchment approach sounds great – education, collaboration etc. – but there are no improvements in water quality – the problem is that it requires quite a lot of political power (…)"* (Respondent B11).

Several respondents from the second stage of data collection (Section 3.4.3, Figure 8) shared the view that the outcomes of the first cycle of the WFD implementation will not go much further than reviewing what we know about the environmental system, what kind of rivers we have, and what kind of data we have. According to respondents, true catchment scale thinking is not yet developed, even though there have always been catchment based water management organisations in England. From the monitoring point of view the common opinion is that *we should monitor for models and not without models* and that, if evidence gaps are observed in the catchments, the knowledge would have to improve so to have better understanding of catchments as natural systems.

## Integration of RBMP and WCS process

The researcher constructed two ways of assessing the possible integration of the RBMP and WCS processes:

- Relation of the WCS process and RBMP; and
- relevance of the WCS processes if that is proceeded without taking into account the land use of the according case study area.

Respondents shared the view that the WCS should be a living document – thus its results should be reviewed (monitored) to see if the strategic planning has been successful. A lot of questions about the integration of the RBMP with the WCS process remained open. While academia provided a scientific view on evidence gaps within sustainable water management, stakeholders form Anglian River Basin District Liaison Panel (ARBDLP) provided some important views on integration of the WCS and RBMP from practice.

### Relevance of WCS process to RBMP

The researcher divided opinions of practitioners and academia into two groups:

- Stakeholders that viewed it as too early for any integration (academia);
- Stakeholders that stressed importance of the integration, but did not provide a clear solution to integration (members of ARBDLP).

Often academic reaction to the question on how WCS and RBMP integrate did not provide a clear answer:

> *"(…) I think it's far too early to say that (…)"* (Respondent B14)

Some reported on problems of attempts to integrate parts of RBMP into an integrated strategic plan of measures, and institutional and operational problems thereof:

> *"(…) to come up with sort of integrated RBM plan, but it's very difficult. There was a table at the back which had water companies, local planning authorities and farmers,*

> *and they showed it was at least an attempt but it ended up as four separate columns … and there was difficulty in integrating them because a range of drivers and tight scales and planning processes are different (…)"* (Respondent B20)

Member of ARBDLP on the other hand provided some information on current activities in considering integration. One thing was certain – RBMP cannot be prepared without the relevant WCS studies:

> *"(…) Based on my limited knowledge of the WCS process I feel that they have a significant importance for the implementation of the WFD through the RBMPs … On one hand you have an assessment of the water resource in and on the other a future calculation of requirement, a balance must be sought and the RBMPs must consider how this is going to be achieved in conjunction with the other WFD requirements (…)"* (Respondent B24)

One of the impressions how the two processes work was given by one of the ARBDPL members interviewed for this thesis. The respondent explained that the WCS process and implementation of the WFD are a mixture of two types of implementation processes – bottom up and top down.

> *"(…) The WCS look at the process from the bottom up, whereas the WFD sets high level objectives and standards - top down. The opportunity is for a regulatory process to join them in the middle. It is too early to tell how successful this will be over the 3 WFD planning cycles (…)"* (Respondent 25)

However, the linkage between the WCS and business plans is much more powerful and effective than the top down link:

> *"(…) The impact of the WFD on the current water asset planning cycle, PR09 leading to AMP5, has been limited. There is better linkage between asset plans and the WCS, provided they are using the same assumptions on growth (…)"* (Respondent 25)

Surprisingly one member commented the future integration of the WCS in RBMP as:

> *"(…) It could be included in the glossary of terms! (…)"*

However not much optimism in the first cycle of WFD was expressed:

> *"(…) In reality the RBMP may not deliver too much in the first round (...)"* Respondent B23

To create some steering the research was pushing the ideas and asking whether the importance of local land use, as one of the factors influencing local water environment, should be considered together with the impact of planned urban growth in the WCS strategy and if that would help in minimising the evidence gap for evaluating the influence of both on the catchment. Or whether WCS should explicitly be called Urban W*CS*. The system thinking behind was that every WCS in practice has a problem, when modelling the impact of increased point source pollution due to urban growth, because it recognises that it can not control diffused source pollution directly (namely agricultural practice) the strength of the WCS is limited, i.e. evidence base provides more evidence than needed for planning the local urban development, but does not give any powers or clear plans of action to deal with the problem of water quality fully.

A bit more discrepancy was in opinions whether the WCS should take into account full catchment approach. For instance, academics were viewing that there are ways of integrating the urban water cycle with agricultural water use, however there would need to be "gluing" systems in place to do that. One respondent provided a very interesting view on the question of whether there was actually an opportunity / room to undertake a *catchment based approach,* expressing concern about how needed it was but difficult it is looking across interlinked issues:

> *"(…) There is a risk in integrating too many things together, that you create a too difficult mess to manage … if there's a pollution problem in the river which is a consequence of runoff or high rainfall events then that would suggest the spatial plan ought to reflect system to reduce a pollution runoff into the river.*

However the respondent was not entirely sure if urban plans should intervene with other land use plans:

> *But whether or not largely urban plan should seek to intervene in operational that seems to me to be unnecessary or inappropriate because what would you get out of it? (…)"* Respondent B20

After the researcher implied that this sort of plan could feed directly into the relevant RBMP, the respondent replied innovative approaches could offer a working spatial plan is managing the impact of different sectors on water status in a catchment:

> *"So it strikes me you would need a mechanism of gluing together water and waste water services to an area with perhaps agricultural land management."* (Respondent B20)

Further expressing the problem of implementing the "polluter pays principle" that occurred recently:

> *"(…) But there's an issue that Ofwat as the regulator had – whether or not companies can charge customers on work they do with farmers while the farmers can be seen as polluters – there's a principle. Ofwat had a problem with justifying that expenditure (…)"* (Respondent B20)

On the other hand Respondent 18 had a different view on the importance of agricultural practices in the catchment and its relevance to the successful WCS process:

> *"(…) Given the fact that urban areas are just a small proportion of catchment, what you do about the sustainable urban drainage maybe important but it's probably not so important as what you're doing about overall catchment land use and particularly agricultural practice (…)"* (Respondent B18)

Similar evidence gaps were identified by a key-stakeholder from the MK WCS Steering Group and respondents from academia. The most frequently identified gaps by academic staff are listed below:

- temporal precision of data – some of the events in catchments are short lived and might not be picked up by the EA network;
- the knowledge about catchments and the processes is incomplete – for instance, regarding sediment transportation and contamination;
- evidence for value of interventions in evidence based-planning and implementation of the WFD
- no fit-for-purpose monitoring

Just as an example, Respondents B14 and B20, on relevance to valuing interventions, stated:

> *"(…) Some of my work is in integrated management and adaptive resource management and if you look at evidence for the value of interventions based on those framework you really struggle to find it, and yet most practitioners would say now that their reasons are informed by Adaptive Management and yet the evidence for that is not any better than we have (…)"* (Respondent B14)

> *"(…) It is difficult to estimate what is the relative benefit to the consumer and the environment (…)"* (Respondent B20)

And in relevance to difficulties in monitoring and validation, stating that the validation process is very difficult because strategic policy level tends to have no control and no historical data to validate against:

> *"(…) Because the evidence-base planning tends to be on a strategy policy level, you know it's not about optimising the use of a reservoir or clogging residual in water distribution system that's hard science. I think almost by definition they're difficult to evaluate because there's no control and no historical data saying what you're doing now is better than you were doing before (…)"* (Respondent B20)

**Soundness of the LDFs and evidence gaps**

To explore the connection between the requirement for a sound plan under the Planning and Compulsory Purchase Act 2004 and the role of an appointed independent inspector from the Planning Inspectorate in preparing the LDFs, interviews were made with the representatives from the Planning Inspectorate. The interviews, apart from broadening the knowledge about the notion of soundness, had one objective, which was to explore how deep into the evidence base inspectors can go and what implications evidence gaps have on the soundness of the LDF.

The function of the examination under the new system is to judge the soundness of a spatial plan from page one to the end, as the inspector explained, with a base line that the plan is sound:

> *"(…) Under the new system we have to test the soundness of the entire document (comment: LDF). People don't make objections, they make representations. So, my starting point is not to say it's unsound … right … and lets see if we can make it sound. My starting point is that it's sound unless somebody says it isn't (…)* (Respondent B17)

The depth of soundness of the evidence base feeding in to the LDF depends on the detail of the planning document within the LDF i.e. the inspector can go more in detail in the development plan than in the Core Strategy, however concerning the quality of evidence base the respondent stated:

> *"(…) In terms of the quality or the adequacy of the evidence base, we would very much rely on the body that is responsible for checking it. In this case the Environment Agency. The first question I ask when I have the strategic flood risk assessment is "What did the environment Agency think about it?" and in the last three cases they've come along and said "We're quite happy with that" (…)"* (Respondent B17)

The respondent also explained that the process of evidence validation, as an essential part of the LDF and multiple-stakeholding process, should confirm, improve or clarify

the quality of evidence in use. Moreover, evidence should be sound i.e. "factually correct" in the sense of hearing:

> *"(…) Base evidence should be the evidence to support the plan … you need to make sure that the evidence is sound, that's its factually correct. Often you get challenges on evidence because it isn't correct (…)"* (Respondent B17)

The inspector's opinion is that the new spatial planning system does bring a change to, and improvement in, the system of gathering the evidence base:

> *"(…) under the old system the council didn't have to produce any evidence. All they had to do was to produce evidence to object the objections. And, under the new system they have to produce it to support their plan. (…)"* (Respondent B17)

## 4.3 Findings from the third stage

### 4.3.1 Introduction

Third stage of data collection consisted of a survey completed with the MK WCS Steering Group after the group finished the Outline phase of the MK WCS. The emphasis of the research was put on following questions:

- To explore if the role of the key-stakeholders in spatial planning, through MK WCS process, changed;
- To check if the quality of evidence was improved with the process;
- To explore if it is in the power of the WCS process to solve the evidence gaps;
- To explore the opinion about the relevance of the MK WCS to the relevant RBMP;

### 4.3.2 Main Points

**Role change**

For most of the stakeholders spatial planning is new. For example the EA stated that their role in spatial planning, since they have become a part of the WCS process Steering Group has changed:

> *"(… ) substantially. We are becoming a very important part of decision making in spatial planning. That was not the case before (…)"* (Respondent C8)

Similarly the same king of response came from the MKPT and IDB. While some of the key-stakeholders report their role is the same, they acknowledge the joined-up approach that the WCS process results in is new and helpful.

## Evidence quality and relevance of the MK WCS process in diminishing evidence gaps

Even though the evidence base lies mostly in the hands of the EA and WCS the joined-up approach of the WCS process allows for validation of that evidence. In this sense, a crucial stakeholder is IDB providing local knowledge on fundamental hydrological processes, such as connectivity of floodplain with the local river body. EA reports on evidence validation, as below:

> *"(…) Whilst the report, in general terms, provided what was required, certain aspects required revision. Various EA functions have been consulted and their comments fed back to the consultants who are making the necessary changes. It is important the Phase 1 report deals with all the issues raised by the EA given the report will provide the necessary evidence base to support MKC's LDF (…)"*

An example is provided by the field note that was taken during the MK WCS Steering Group meeting on the Outline MK WCS, where stakeholders challenged the topic type and extent of the SUDS:

> [EA]: prefers open space SUDS, they also cost less and we would like to highlight ecological benefit
>
> [MKPT, IDB]: objects, they have maintenance issues. They prefer bigger areas and then leaving some areas for the habitat to evolve.
>
> [MKPT]: asking how to decide what percent of those areas would be enough and what habitats do we want.

Evidence validation is an important part of the WCS process and it helps in understanding the local environmental system functioning.

**Relevance of the WCS process for RBMP**

The Steering Group was unanimous that the MK WCS is a crucial document for the Anglian River Basin Management Plan.

## 4.4 Summary of the findings

Findings from each stage of data collection were presented in this chapter. Throughout the three stages an effort was made to provide insights to a very complex process of spatial planning and its relevance to the WFD through WCS process. The findings are summarised below and further discussed in Chapter 5.

The role of each of the MK WCS key-stakeholders is predefined and differs due to the fact that the WCS are defined as technical documents which demand an inter-disciplinary team of experts. Roles overlap and are influenced by the WCS process itself. Different drivers for participation in the MK WCS process were identified. Participants have different aspects of knowledge about the WFD and its implementation. Their attitudes and activities towards the Directive differs according to **(a)** responsibility for its implementation, **(b)** pressures coming from devolved responsibilities for its implementation, and **(c)** in accordance with expected implications of the WFD implementation on their business.

MK WCS presents important evidence for all stakeholders and is the basis for their future plans (spatial, business, organizational). MK WCS Steering Group members contribute to the process with evidence of different types, sources and qualities. Moreover, they differ according to whether they have a monitoring programme or not. Few quality limiting factors were identified by the MK WCS Steering Group during the semi-structured interviews and the evidence quality evaluation based on pre-prepared matrix. Additionally several opinions about evidence quality used in the process were elicited. Limitations of the WCS process as part of sustainable water management led to second stage of the research where the research interest was focused around the WCS

evidence base and importance of the process in challenging the limits of understanding of the water cycle and its influence on urban development. On one hand the quality of the WCS evidence base is its ability to take into account the existing legislation and contribute to its implementation though a set of measures. This is what makes the LDF "sound" and based on a credible and robust evidence base at times when it is tested (e.g. public hearings). On the other hand the MK WCS process, as set up, challenges the understanding of the functioning of the sub-catchment system because it notes where data limitations exist use is made of knowledge of the local key-stakeholders in evaluating the evidence base.

The role of some of MK WCS Steering Group members changed in the sense that some of the stakeholders proved to be more important for the process than it was expected, while for other the roles got clearer. It was found that the process helped in reviewing what sort of evidence is being collected, where the gaps are and what sort of changes need to be made in the future (and this applies equally for the regulated and regulators). The MK WCS process opened several questions in relation to the implementation of the WFD and in relation to preparation of the relevant RBMP. The findings show the connection between the WCS process and RBMP is fundamental, however not explicit. The finding also show that integration of the RBMPs and the WCSs (both being spatial plans, only on different scales) is needed, however it might be ineffective if ill defined. Nevertheless, the opportunities for integration of these two spatial plans will have to be created in the future cycles of WFD implementation in order to use the evidence base, or use the knowledge gained about the evidence gaps on sub-catchment scale, through WCS, and transfer that on the catchment scale. The findings are discussed in the next chapter.

# Chapter 5: Discussion

*In this chapter the findings of the study are explored and discussed. Insights on the WCS process are gained by reviewing the findings highlighted in the previous chapter in light of the findings of the literature review.*

## 5.1 Introduction

In this chapter the findings of the research are discussed in the light of findings of literature review. The main focus is on stakeholders of the WCS process, and the relevance of this process to the promotion of sustainable water management in urban development. Special attention is being placed on reformed spatial planning and its relevance to the implementation for the WFD through the WCS process. The current and future implications of this process for the implementation of the WFD are fully discussed.

In this exploratory research, the author made an effort to present an insight to the current spatial planning process in England, particularly in relation to planned urban development and its implications for future implementation of the WFD. So as the WFD in its first cycle continues to make us question our understanding of sustainable water management, equally the limits of the WCS process and its role in sustainable water management are questioned in this thesis.

## 5.2 Discussion

### 5.2.1 WCS process and Stakeholders

This study considered a multiple-stakeholder process within current spatial planning for urban developments and found that, as consistent with a description in recent research by Haughton (2007), the key-stakeholders are involved in this non-statutory process so that they form a complex and dynamic process of decision making. The devolved

responsibility for joined-up planning (i.e. sustainable water management) results in of lively and interactive meetings where social relationships formed could be described as "soft spaces".

> *Emergent 'soft spaces' of planning are valued as a mechanism which encourages more creative thinking, unconstrained by regulation and national guidance, and providing greater opportunities for a range of non-planning actors to engage more productively with planning processes* (Haughton, 2007).

The interactions result in output s– in this case an Outline MK WCS, a strategic plan of sustainable water management for planned urban development.

> *"(…) Its this forward looking policy planning system we're trying to make work (…)"* (Respondent A5)

The concept of forward-looking policy making, which the WCS process is adopting, is not new. It has been well developed and used in the past 30 years around the world. However, more recently its increased use can be observed in the public sector and amongst others *driven by growing importance of decentralised decision making, alliances and networks and the development of shared views* (Gavin and Scapolo (1999) in Bochel and Duncan, 2007).

From one stakeholder to another, the drivers for forward-looking policy making differ. Part of the reason is embedded in the history and nature of how organisations were set up, while some of it is hidden in the present legislation and trends on evidence-based planning and forward-looking policy making under the current planning and policy making process. Each key-stakeholder has its own task and interest in the MK WCS process. Some of them influence the process more than others, as was expected beforehand. The study revealed that this was not only because of the relationship between regulators and regulated but also because of the importance of validation of the WCS process' outputs by local knowledge the inter-sectoral nature of collaboration is essential. Consistent with findings of Haughton (2007) improved dialogue between planners (MKC) and other policy sectors (EA, WC, MKPT, IDB) and the consultant is

evident. By interacting more the key-stakeholders influence each others policies, which is different to findings of Haughton (2007). An example to support this, from observing the MK WCS process, is that the EA is working in partnership with MKC to deliver sustainable water management for urban development through the LDF. But, as a result, the MK WCS may affect the programme of measures set in the forthcoming Anglian RBMP.

Even though the WCS studies are not a statutory obligation yet, there is a specific combination of four factors that makes undertaking the WCS process sensible for the key-stakeholders. These are:

- present concern about improving the status of water environment;
- increased motivation for sustainable development;
- increasing business opportunities; and
- reformed spatial planning process.

These factors are a response to a combination of:

- known consequences of the past man-induced hydrological changes to the water environment, and
- the reserved/precautionary attitude to the unknowns of the future and hence the required flexibility of spatial plans;

These finding are supported by interviews conducted in the course of the research and reflect the work done by, for instance, Holder and Lee (2007), Nadin (2007), and Acreman (2000). Culture change is happening in the sense that the joined-up working is more explicit between different organisations involved in this part of the local spatial planning process (the WCS process).

### 5.2.2 WCS process and WFD Implementation

The study found that stakeholders have different knowledge about the WFD, different legal responsibilities / devolved responsibilities, that the relationship between the MK WCS and the WFD is not explicit, but is strong, and that WCS process is in some

respect surpassing the relevance of the RBMP. Interestingly the WCS process probably helps make the RBMPs "sound" i.e. factually correct in estimating different pressures on the water environment within the catchment and thus in the river basin. Because the current literature provides very little information on the WCS process and its relation to the WFD implementation, a context analysis of the Directive itself had to be made in respect to the current WSIG to understand the interface between the implementation of the WFD directive and the WCS process (the analysis is detailed in Chapter 2). The study showed there are some strong interrelations between the two documents. Even though the study of the WCS process showed that the WFD is not being debated during the process, and that all that is demanded from consultants performing the WCS is a "symbolic paragraph" on the WFD, the WSIG adopts principles in accordance with the WFD. Devolved responsibility for implementing WFD, on the shoulders of the local planning authority, can be seen in practice from the WCS process. That is consistent with findings of Holder and Lee (2007).

Interestingly, even though Carter (2007) fears that parallel systems of water management might evolve at least at the beginning due to non-existence of RBMPs, it is important to note that findings show that if anything the WCS process will significantly inform the RBMP process – due to the detailed nature of the WCSs. However this is only in the sector of delivering water services infrastructure for growth with considerations of flood risk, water resource delivery, capacity for water and waste water treatment, and influence on water quality. The WCS process can incorporate the influence of land use on especially water quality in the catchment; however there is neither interest nor defined institutional way how of respond to the findings. In the WCS process land use and its impact on water quality of local water bodies is actually a "noise", an excess part of the evidence base with which is not fully dealt with. Therefore the author believes the notion of *water cycle* is misleading to some extent and should be explicitly referred to as the "urban water cycle".

### 5.2.3 WCS process and Evidence Quality

The study found that evidence quality does not have particular implications on soundness of the LDFs as needed by *The Planning and Compulsory Purchase Act* (2004). For the soundness of a particular spatial plan the most important factors are adequacy of evidence base and transparency of decision making, no matter how detailed the spatial plan is. As implied earlier the transparency required to show there are uncertainties related to monitoring or understanding of a catchment as a system, do not influence the decision making process unless the key-stakeholders of the Steering Group insist so. In the MK WCS process the local knowledge (IDB), WC and the consultants seem to be essential in validation of the evidence in use and not the regulator (EA). It seems that the organisation in power of influencing the allocation of the development through building consents (EA) on the other hand does not have the power to fully validate the evidence base used in the WCS, the crucial "technical" document that underpins it.

The WCSs are "technical" documents. However, it is important to note that this research showed that when uncertainties arose, which is consistent with Duncan and Haropp (2007), Adams (2001), Brown (2005) or Ison et al. (2007), the decisions in the WCS process over the future of environmental system, in some cases, reflect rather a social construct than they would reflect the physical nature of the system. This means that knowledge about the functioning of the catchment as a system is revealed only to some extent, while the resilience of the system itself is not a subject of the study. Similarly the other activities in the catchment such as agricultural land use and its influence on the water status are not taken into account. However, the WCS process does enable constructive interaction between stakeholders so that not only assumptions, but also facts taken for granted, are questioned. That appears to be the expectation of many involved in the WCS process directly or indirectly (for instance by independent examiner and interviewed academic). Both "knowledge is power" and "power is knowledge" approaches define what counts as prevailing interpretation (evidence) in such decision making (Bacon (2000) and Flyvjberg (1998), cited in Davoudi, 2006).

There were several observations made in respect to the change of evidence quality. The observations about evidence change would conclude that the evidence base for the WCS is being built as the WCS process continues. The process of validation of the evidence base is a very important part of quality of the WCS at the end. Validation is highly dependent on knowledge of key-stakeholders. However, as seen from the process, the extent to which scientific evaluation can be made is limited to the scope of the particular WCS. Consistent with Duncan and Haropp (2006) external validity is more important. Because of that, the importance of evidence quality change has limited benefit for the WFD and its implementation. Instead of taking the opportunity for the catchment system to be more understood, and thus contributing to more robust RBMPs, the extra evidence in some case is not used but only recorded:

> *In particular, it lends support to the fact that diffused and point source nutrient enrichment are a key concern. However, it should be noted that catchment specific investigations and modelling would help to confirm the actual status of the watercourses around Milton Keynes, and determine proportions of loads from each source (point or diffuse, urban or agricultural).* (MK WCS - Outline study; WCS Scott Wilson Ltd, 2008)

As seen from the case above there is a lack of clear cross-institutional way to deal with the diffused source pollution and its impact on quality of water. However there are less limited validation comments that are taken into account, as for example hydrological issues like the connectivity of the river with its floodplain and its implications for water quality control.

During the research an effort was made to explore what is the perception of evidence quality that the MK WCS Steering Group is using. This was done with the help of a matrix that was constructed beforehand by the researcher. The matrix used descriptive and numeric scales with adjectives provided to describe the quality of evidence. The study found out that the respondents felt more confident in using the descriptive scale rather than assigning "quality numbers" to evidence. While it was beyond the scope of this thesis to explore why the respondents reacted this way, it is important to note that the matrix was a good tool in helping respondents of the MK WCS Steering Group to

focus on evidence at a time. The majority of respondents felt comfortable with evidence they used while some for them were critical. For example CO reported that evidence EA provided by the EA is good, but not good enough. One of the reasons given was that they felt data provided by EA did not cover some of the events in the river system; for example concentrations of phosphorous. This demonstrates to us that "user perspective" valuation is important and happens within the WCS process. The other observation important to note is that the MK WCS Steering Group included the time aspect in evaluation of evidence. The respondents argued this with opinion that evidence quality needs time and is dependent on the WCS process itself.

Furthermore it was found out that the WCS process depends on the features of the Steering Group conducting the study. Added value have been made to the WCS through identifying data limitations, methodological limitations, and system problems in joined implementation of the WCS process. This instance is summarised in Chapter 2. In the case of the MK WCS process, data limitations were considered explicitly by the consultant. However this did not bring great improvement in the WCS in the eyes of other key-stakeholders in the group. It is fair to note that the WCS process is new and culture change needs time as well. As some authors concluded there is a need for *culture change* (Kidd and Shaw, 2007) to start and implement the integrated spatial planning and learn from the experience it brings.

## 5.3 Summary

The findings of this thesis were discussed in light of the findings of the literature review and author's observation. The aim of this research was to critically assess the limitations of the WCS process and its possible impact on the implementation of the WFD. Insights were sought on the spatial planning system and its relationship to the sustainable water management for urban areas and its possible impact on the implementation of the WFD. Three themes were important to discuss when observing the WCS process – stakeholders, WFD implementation and evidence quality. The research ends with final chapter where conclusions and recommendations for further research are summarised.

# Chapter 6: Conclusions

## 6.1 Reviewing the Aim and Objectives of the Research

In Chapter 1 the aims and objectives of the research were set out as follows:

**Research Aim**

To critically assess the MK Water Cycle Strategy (WCS) process to provide insights into how sustainable water management, required by among other things the Water Framework Directive (WFD), may be realised and integrated within spatial planning in England.

**Research Objectives:**

1 To critically review the relevant literature, other necessary national guidance, and secondary sources in relation to:
    - the origins and principles behind, and attributes of the WCS process and its outputs;
    - interactions between the local spatial planning process, the implementation of the WFD, and the WCS process in England.
2 To identify the stakeholders involved in the MK WCS process and understand how they interact and influence the preparation of the MK WCS.
3 To identify factors that have influence over the process of evidence change in relation to the MK WCS process.
4 To explore the implications of the MK WCS on the spatial planning processes which aim to promote the sustainable development of MK.

Both the aim and objectives of the research have been met through the research questions and sub-research questions which arose during the course of the research. From the literature review it was found out that the WCS process is a new process in

spatial planning, tightly, though not explicitly, related to the implementation of the WFD. In order to understand how the complex social process of delivering planned urban growth is being realised in practice and explore implications of WCS process to sustainable development, it was necessary to assess (a) the influence of the WCS process on the key-stakeholders, and (b) identify the drivers behind the process of evidence validation during the WCS process. To be able to critically assess the current strengths and weaknesses of WCS process it was important to include a diverse range of practitioners and scientists, which contributed their view over the issues and process.

Finally knowledge gained from the extensive literature review together with presenting academic and practical experience was assembled to provide the reader with a comprehensive story about how the sustainable water management in contemporary planned urban development is being realised and what relevance it holds for the future of both. Thus the aim of the research project was met.

## 6.2 Conclusions from the thesis

Little information about the WCS process can be gained from the literature; however literature provides a reader with a good overview of the historical reasons and current legislative reasons for progressive WCS process behaviour. Simple context analysis of the WFD directive shows the two – implementation of the WFD and the WCS process – are tightly connected and inter-dependent.

### 6.2.1 WCS process and Stakeholders

- The WSC process is a new process for the majority of key-stakeholders which enables them to interact with the reformed spatial planning system more explicitly. For some of them that was not the case in the past. Regulators are now closer to those regulated and on both sides social learning is one of the outcomes of the process.

- The WCS process changes the predefined importance of key-stakeholders as the WCS process evolves. Some key-stakeholders were shown to be crucial for validation of the results of the WCS. For example IDB, even though it is a small organisation and seems unimportant, at the end of the WCS process in MK, it played a key role.

### 6.2.2 WCS process and WFD Implementation

- The WCS process in spatial planning sought to provide sustainable spatial strategies (suitability maps with more complex set of criteria) and in this the WFD is just one of many pieces of legislation that this process is following. As could be seen from the content analysis of the WFD, the WCS process and the Directive adopt several principles common to both, though the connection in literature and practice is not explicit.
- Major spatial plans of measures under the WFD – RBMPs – are still being prepared thus WCS process can not take them fully into account. Nevertheless, the WCS process is important for the content of the relevant RBMP because it identifies and estimates urban pressures on the water environment, and thus should serve as a basis for their preparation.
- The implications of the WCS process are not limited only to growth areas but extend also into other areas around. The WCS process is helping to implement the WFD in the sense that it reviews the evidence base that is available on catchment scale. The findings about data / evidence limitations should therefore be used in the next phases of WFD implementation.

### 6.2.3 WCS process and Evidence Quality

- The WCS process is an interface between sustainable water management and contemporary spatial planning, focused on the influence of urban growth on the water environment. It is special because it demands an inter-disciplinary approach. Research showed that this approach makes the evidence base to some extent more robust. The WCS process provides an evidence base for LDFs and thus contributes to a reformed spatial planning process.

- Research also showed that local knowledge plays special importance in evidence evaluation which again contributes to a more robust evidence base. The research has also shown that the importance of monitoring systems of some stakeholders becomes clearer during the process. Moreover, the WCS process challenges the monitoring systems of regulators, thus challenging assumptions behind the evidence-based planning.

## 6.3 Recommendations for further research

The major weakness of the methodology undertaken for this research is that it is very extensive, because it observes real process and notes real situations and most of all tries not to affect the process. This means the researcher has to be focused and alert to be able to describe the WCS process and its features. This was done during this research. However, due to this research, at least some of the findings can be generalised (due to carefully chosen sample of respondents, which includes both regulated as regulators). Similar features of the WCS process are similar also in other working groups, as was confirmed through observing the neighbouring Bedford and Marston Vale Steering Group or studying the work of the Cambridge Steering Group. Because this research revealed some of the factors, that have influence over the process of evidence change and understood and defined stakeholders' activities in relation to the implementation of the WFD, it provides the reader with a comprehensive story that could be further explored in the future.

The main weakness of the WCS process was its inability to utilise a catchment scale approach, which is needed to fully understand potential implications of planned urban development in a specific catchment. Paradoxically the WCS process collects evidence that cannot be fully used and taken into account (for instance evidence on sources of pollution of surface waters) because the WCS process focuses only on impacts of planned urban growth on the water environment. Participants in the process acknowledge therefore, that future research should focus on integrating different pressures in a catchment, thus creating a comprehensive plan of measures that would

limit pressures and provide protection on different levels and not only from newly planned urban growth areas.

The research showed there is a dynamic decision making process connected with the WCS process which enables assumptions about functioning of the hydrological system to be challenged. The process examines catchment based information of both – regulators and the regulated. It shows where are the sub-catchment scale evidence gaps and what evidence-based will feed into the upcoming RBMPs will be. Therefore the future research should focus more on how to take into account new evidence gaps and improved catchment models to improve existing regional and national data-bases. This would contribute to implementing the WFD in future cycles.

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# APPENDICES

# APPENDIX A: Milton Keynes study area description

## 8.1 Why a specific site – Milton Keynes study area?

To understand why Milton Keynes as a growth area is a special site and to understand why it was chosen for the research as a case study, some history of the place needs to be given at this point. The book by Benedixon and Platt entitled "Milton Keynes: Image and Reality" provides a good background to some of those reasons, which if combined with the ideology of the present time, gives a reasonable justification.

Even though the city has a young history, it is somewhat exceptional in England. From its first steps across the fields up till now the city has had been an area of a great interest. The new town was planned to relieve the pressures in London; to provide a safety valve in respect to the other towns in the country's fast growing south; and as a response to the population explosion of the 1950s; the idea of a garden city rose into a multi-centred and low population density city. From the idea, through clouds of uncertainty, to formal designation of a new town called Milton Keynes, on 23 January 1967, the process of creating a new city – apart from its challenging nature and political disputes, interestingly, dealt with two issues that appear as crucial even today when facing the present growth. These two issues shape the development even today.
Those two issues were:

- the impact of urban growth on environment, particularly the River Ouse, and
- the relevance of spatial planning process in resolving issues of importance.

The first was raised as a concern by Bedford, the neighbouring town located downstream of the Ouse. Similarly, as in today's process of the MK WCS, the concerns were raised about the impact of additional effluent from the WWTW into the river, that the town downstream uses as a source of drinking water. The latter was not an issue as such. However, the connection in the sense that the national and regional spatial planning were increasingly seen as tools to implement the level and type of growth on

which the government has decided upon is clear. The importance of the public inquiry and the role of inspectors were significant.


Figure 13: South East England Region (South East Regional Assembly, 2004).

It is necessary to distinguished between two types of growth locations - *growth areas* and *growth points*. There are four growth areas announced in the Sustainable Communities Plan (2003) – Ashford, London-Stansted-Cambridge-Peterborough, Milton Keynes and South Midlands, and Thames Gateway. Apart from those there have been several locations identified as growth points. The objective was to support local communities who want to undergo bigger scale sustainable growth, but outside the areas identified as growth areas. Thus so called New Growth Points were established in East Midlands, East of England, South East, South West and West Midlands (Communities and Local Government, Accessed 26th August, 2008). Map of the growth areas and points is available in Figure 14 (Communities and Local Government, Accessed 26th August, 2008)

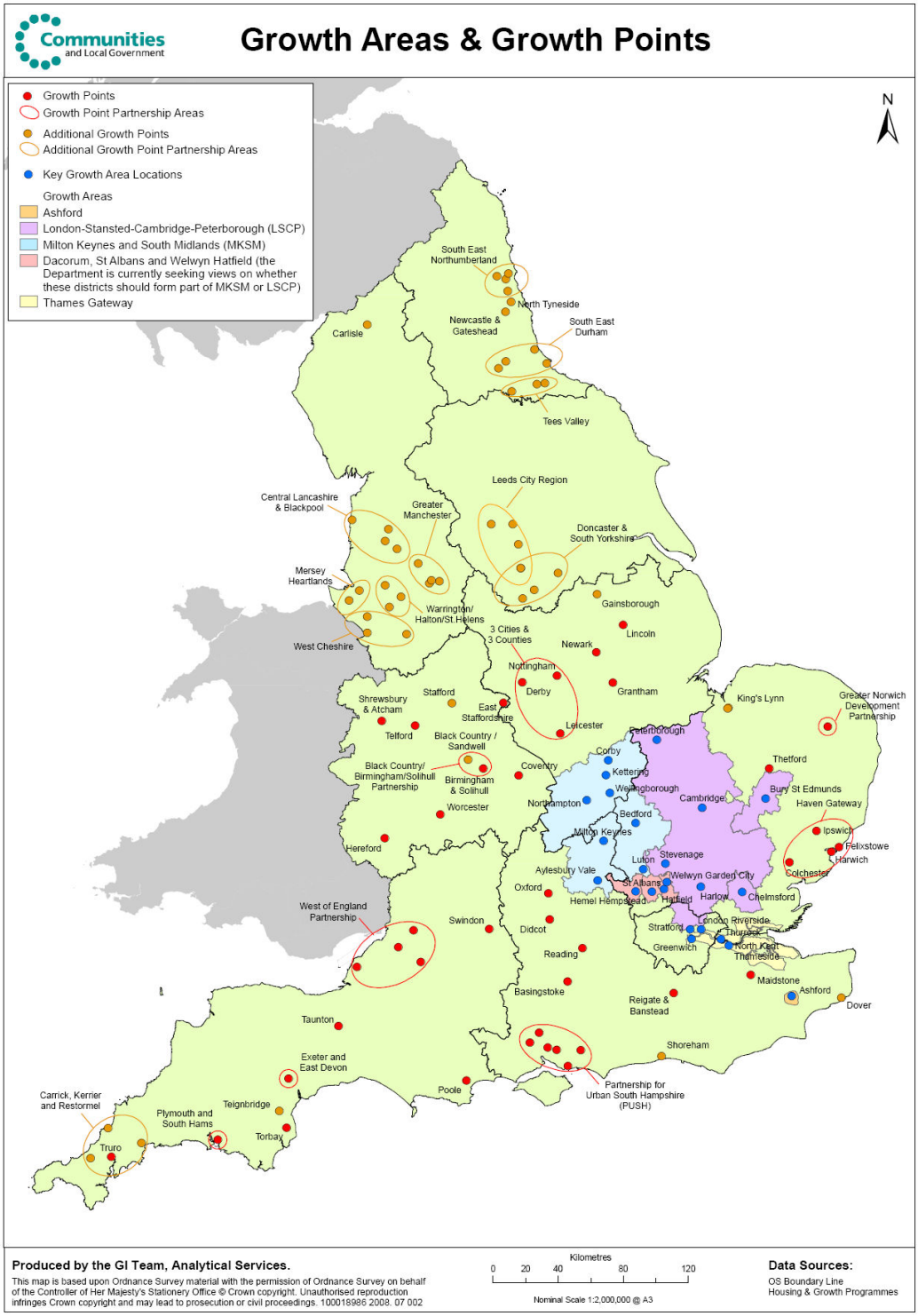


Figure 14: Map of Growth Areas and Growth Points for England (Communities and Local Government, Accessed 26th August, 2008).

## 8.2 Milton Keynes within the Water Framework Directive

### 8.2.1 Anglian River Basin District and Milton Keynes

The MK growth area is situated within the Anglian RBD (Figure 13) which covers an area of 27,890 $km^2$ including East of England and part of East Midlands UK Government Office Regions. As shown on Figure 5 (Section 2.1.2.3) the RBD lies between Lincolnshire in the north, Essex in the south and Northamptonshire in the west. The geology of the RBD is diverse, from chalk and limestone ridges to the extensive lowlands of the Fens and East Anglian coastal estuaries and marshes. Twenty percent of the district is lying below the sea level therefore several hundred kilometres of coastal and estuary defences protect the coastline (Environment Agency, 2007). The Anglian Water region is one of the driest in the UK with annual rainfall 600 mm. Only 25 % is available as a resource after evaporation and usage by plants. Moreover, evaporation surpasses rainfall as summers are normally long and dry (Anglian Water Services (2007), Environment Agency (2007)).

The whole district is intensively used for farming (cattle and sheep farming, pig and poultry keeping) and horticulture. Surface water is the main source of fresh water abstraction, followed by groundwater presenting 40 % of source share. The chalk in the Great Ouse River basin is the most relevant source of groundwater for housing, industry and agriculture (Figure 15). The district's industry is mainly construction industry, and the most relevant manufacturing industries are food, drink, tobacco and paper printing and publishing sectors. Business services, retailing and health sectors are the largest employers of the region (Environment Agency, 2007). There are six million people living and working in the RBD and two out of four national growth areas lie within it – the London-Stansted-Cambridge growth corridor and the Milton Keynes-South Midlands growth corridor. For meeting the demands set in the WFD it is expected that spatial planning will have an important role helping mitigate the negative impact of fast development on the water environment, as stressed in the Initial Guidance on the WFD and Spatial Planning (Environment Agency, 2007).

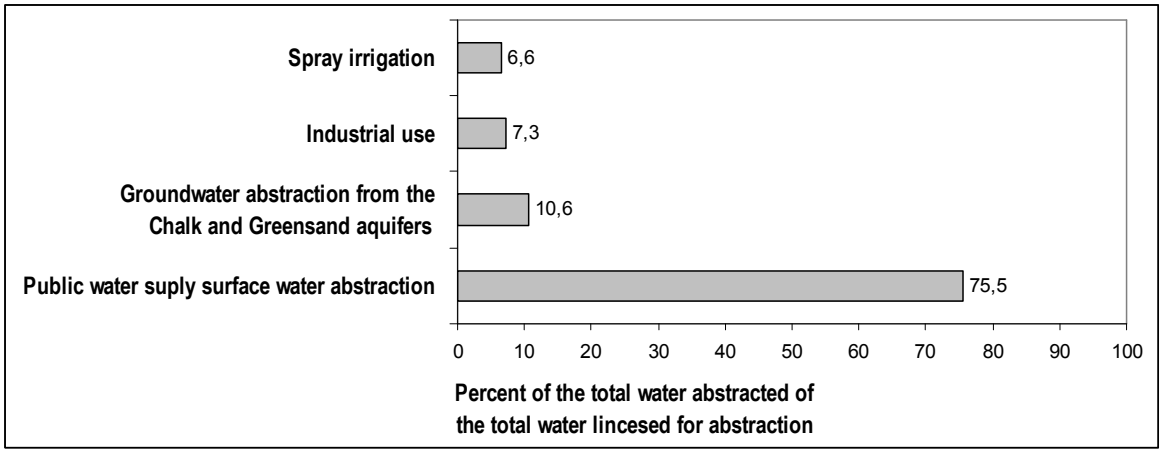


Figure 15: Percent of the total water abstraction of total water licensed for abstraction in the catchment – Upper Ouse and Bedford Ouse CAMS area – according to its use (The Upper Ouse and Bedford Ouse Catchment Abstraction Management Strategy, Environment Agency, 2005).

## 8.3 Milton Keynes Growth Area Water Cycle Strategy

The South East Plan is a regional spatial strategy that covers the South East region of England. Its main purposes are to concentrate development in urban areas, focus on the use of brownfield land, encourage more sustainable use of natural resources and help to reduce reliance on private cars. Looking forward to 2026 it sets out strategies for improving the quality of life in the region. The body responsible for region-wide research and implementation of the plan is The South East England Regional Assembly (South East Plan, 2007). The local planning authority is the Milton Keynes Council, who has the responsibility for developing MK in accordance with their LDF – which will replace the Local Plan for the period to 2011 in the near future – documents that set out how the local area may change over the next few decades.

The South East Plan, together with the Milton Keynes & South Midlands Sub-Regional Strategies, recognises Milton Keynes to be one of the important housing areas for the future (South East Plan, 2007). According to the Strategy and Growth team, four decades ago MK was designated as the largest of the UK's New Towns and has grown constantly since then. The population of MK was approximately 222.000 in July 2006 and is expected to increase by 110.000 in the next two decades (MK Council, 2007).

In geographical context, MK benefits from its location between London and Birmingham; connections to the M1 Motorway and West Coast Mainline trains service. Moreover a population of eight million people lives just an hour's drive from the city, which gives great opportunities for economic development (Milton Keynes Local Development Framework, 2005).

This kind of rapid development affects ecological provision and creates pressure on the environment. Thus, mitigation of possible adverse development impact is necessary. For instance, the development of the South East region is expected to raise water consumption, predicting it to be 115 % of the 2004/05 water demands by 2031. However, water consumption per household over the region is expected to remain steady (Water Resources Plan, 2004). To continue the development and achieve sustainable water resource management, the factors of flood risk, water resource, water supply and sewerage infrastructure, wastewater treatment and water quality are the key issues that must be considered (Halcrow Group Limited, 2007). The main aim is to reduce resource consumption of newly developed parts taking appropriate steps e.g. requiring sustainable urban drainage systems, including rainwater and waste water collection and recycling (for more than 5 dwellings development) (Local Plan Policy D4).

Milton Keynes Council launched Milton Keynes Water Cycle Strategy in collaboration with Milton Keynes Partnership, the Environment Agency, the Water Company, a selected Consultant, the Bedford Group of Drainage Boards, British Waterways Board, Milton Keynes Parks Trust and Natural England (Steering Group). The main aim of the Steering Group was to produce an overall Integrated Water Cycle strategy that would meet the demands of sustainable urban growth.

# APPENDIX B: Comparative study of two Outline WCSs

| ASPECT | CASE | |
|---|---|---|
| | **Milton Keynes Outline WCS** | **Cambridge Outline WCS** |
| Consultancy doing the Outline WCS | Scott Wilson Ltd. | Halcrow Group Ltd.; done more WCSs than Scott Wilson Ltd.; from practice if was seen that the consultancy is tightly collaborating with the EA and Anglian Water Services. File notes have proven that this consultancy is considered to be the best to chose for the WCS process |
| Location of the Outline WCS in the WFD sense | England, Anglian River Basin District | England, Anglian River Basin District |
| Pallet of issues covered in the Outline WCS | Growth Context, WCS Methodology and its limitations<br>Flood Risk Baseline, Wastewater Baseline and Capacity<br>Water Resources and Supply Baseline, Water Cycle Development<br>Generation of Flood Risk – SUDS Options<br>Ecological Assessment, Water Quality / Water Framework Directive<br>Development Are Assessment, Water Efficiency<br>Policy, Developer Guidance and Funding | Flood Risk Management<br>Groundwater, surface water management and SUDS<br>Wastewater<br>Water Resources and Water Supply<br>Ecological Constraints and Opportunities<br>Additional Growth Scenario |
| Methodology undertaken for the Outline WCS | Explicit chapter on methodology: Constraints Matrix – Traffic Light Coding. Systematic overview of constraints and opportunities with red – amber – green colour system. Transparent system of decision making. | Not mentioning the methodology |
| The Outline WCS and added value | Overview of Data Limitations and Explicit description of Assumptions that were used in the study. | Overview of Current Approaches, Drivers for Change, Barriers to Change, Responses, Roles of Stakeholders and Actions and Timing in the fields of Water Provision and Management and Flood Risk and Surface Water Management. |

# APPENDIX C: Content analysis of the WFD

| Water Framework Directive (WFD) | Water Services Infrastructure Guide (WSIG) / Water Cycle Strategy Infrastructure information leaflet (WCSL) |
|---|---|
| **Article 1: Purpose:** to establish a framework for protection of … inland surface waters … and groundwaters which: | |
| **a)** **prevents further deterioration and protects and enhances the status of aquatic ecosystems and**, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems; | This Water Service Infrastructure Guide **promotes sustainable development in the implementation of local water and wastewater services**. It aims to identify a common means for the development of Water Services Infrastructure in a timely, sustainable and efficient manner (WSIG). |
| | WCS is determined through an **assessment of the environment** *and infrastructure* **capacity for:** |
| **b)** **promotes sustainable water use** based on a long-term protection of available water resources | • strategic water supply |
| **c)** aims at **enhanced protection** and improvement of the aquatic environment, inter alia, **through specific measures for the progressive reduction of discharges**, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances; | • sewage disposal |
| **d)** ensures the progressive reduction of pollution of groundwater and prevents its further pollution, and | |
| **e)** contributes to mitigating the effects of floods and droughts and thereby contributes to: | • surface water drainage (especially in Surface Water Management Plan)<br>• flood risk management (especially in Strategic Flood Risk Assessment) |
| • the provision of the sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use, | • water supply (repetition) |
| • a significant reduction in pollution of groundwater, | • sewage disposal (repetition) |
| • the protection of territorial waters | |
| **Article 4: Environmental Objectives:** | |
| 7. Member states shall not be in breach of this directive when: | |
| • failure to prevent deterioration from | |

| | |
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| high status to good status of a body of surface water is the result of new **sustainable human development** and all the following conditions are met: | |
| – **all practical steps are taken to mitigate the adverse impact** on the status of the body of water;<br>– **the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan** …. and the objectives are reviewed every six years;<br>– **the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society** of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and<br>– the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of **technical feasibility or disproportionate cost** be achieved by other means, which are a significantly better environmental option. | It is where the WCS and the Spatial Planning for new developments are connected in the Directive. WCS is an evidence base for all 4 pints under Article 4, Paragraph 7 if needed. It presents practical steps; it can provide the explanation; it can provide a study of tradeoffs (study highly dependent on local knowledge and understanding of the meaning of a particular asset); it can accordingly apply the two tests (fourth point). |
| **Article 5: Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use:** | |
| 1. Each Member State shall ensure that for each river basin district or for the portion of an international river basin district falling within its territory: | |
| – a review of the impact of human activity on the status of surface waters and on groundwater, and<br>– an economic analysis of water use | Addressed through Codes for Sustainable Homes.<br>Addressed partly through the data Water Companies have. Other part addressed through the license abstraction systems. |
| **Article 6: Register of protected areas:** | |
| 3. For each river basin district, the register or registers of protected areas shall be kept under review and up to date. | WCS help in protecting those areas. Throughout the study the consultants gather information on the local protected areas. Therefore they can take them fully into account. |
| **Article 7: Waters used for the abstraction of drinking water** | |
| 2. For each body of water identified under paragraph 1, in addition to meeting the objectives of Article 4 in accordance with the requirements of this Directive, for surface water bodies including the quality standards established at Community level under Article 16, Member States shall **ensure that under the water treatment regime applied, and in** | Drinking Water Directive |

| | |
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| **accordance with** Community legislation, the resulting water will meet the requirements of Directive 80/778/EEC as amended by Directive 98/83/EC. | |
| 3. Member States shall **ensure the necessary protection for the bodies of water identified with the aim of avoiding deterioration** in their quality in order to reduce the level of purification treatment required in the production of drinking water. Member States may establish safeguard zones for those bodies of water. | |
| **Article 8: Monitoring of surface status, groundwater status and protected areas** | |
| 1 Member States shall ensure the establishment of programmes for the monitoring of water status in order to establish a coherent and comprehensive overview of water status within each river basin district: | WCS can, because of their detailed overview of local water status, recognise the local monitoring gaps (spatial and temporal) and thus inform national programmes for monitoring. |
| **Article 9: Recovery of costs for water services** | |
| 1. Member States shall take account of the principle of recovery of the costs of water services, including environmental and resource costs, having regard to the economic analysis conducted according to Annex III, and in accordance in particular with the polluter pays principle. Member states shall ensure by 2010: | |
| – that water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive, | Tariff Agreement as an incentive. |
| – an adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of the costs of water services, based on the economic analysis conducted according to Annex III and taking account of the polluter pays principle. | |
| **Article 10: The combined approach for point and diffuse sources:** | |
| 1 Member States shall ensure that all discharges referred to in paragraph 2 into surface waters are controlled according to the combined approach set out in this Article. | |
| 2 Member States shall ensure the establishment and/or implementation of: | |
| • the emission controls based on best available techniques,<br>or<br>• the relevant emission limit values, or<br>• in the case of diffuse impacts the | Good reasons are set out here for a potential for integrating the diffused and point source pollution on a local scale and local knowledge within the WCS. |

| | |
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| controls including, as appropriate, best environmental practices | To information could feed into the belonging RMBP. |
| as set out in:<br>– **Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (1),**<br>– **Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (2),**<br>– **Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (3),**<br>– the Directives adopted pursuant to Article 16 of this Directive,<br>– the Directives listed in Annex IX,<br>– any other relevant Community legislation | |
| 3. Where a quality objective or quality standard, whether established pursuant to this Directive, in the Directives listed in Annex IX, or pursuant to any other Community legislation, requires stricter conditions than those which would result from the application of paragraph 2, more stringent emission controls shall be set accordingly. | |

# APPENDIX D: Description of participants

| FIRST CYCLE | |
|---|---|
| **INTERVIEWEE** | **ORGANISATION** |
| **Respondent A1** | Landscape Planning & Development Manager , The Parks Trust, Milton Keynes |
| **Respondent A2** | Consultant, Senior Hydrogeologist |
| **Respondent A3** | Consultant, Senior Water Specialist |
| **Respondent A4** | Milton Keynes Council, Strategic Environmental Infrastructure Manager |
| **Respondent A5** | Milton Keynes Council, Development Plans Manager |
| **Respondent A6** | English Partnership, The National Regeneration Agency, Milton Keynes Partnership, Assistant Director – Strategic Planning |
| **Respondent A7** | Water company, Growth Planning Project Manager |
| **Respondent A8** | Environment Agency, Sustainable Development Account Manager (Anglian Central) |
| **Respondent A9** | Internal Drainage Board, The Bedford Group of Drainage Boards, IDB Bedford Group Engineer |
| **SECOND CYCLE** | |
| **INTERVIEWEE** | **ORGANISATION** |
| **Respondent B10** | Cranfield University, Reader in Water Management |
| **Respondent B11** | Cranfield University, Head of Natural Resources |
| **Respondent B12** | Cranfield University, Reader in water & environmental law |
| **Respondent B13** | Cranfield University, Senior Lecturer |
| **Respondent B14** | Cranfield University, lecturer in Sustainable Development |
| **Respondent B15** | Various stakeholders, CIWEM Conference, London |
| **Respondent B 16** | Various stakeholders, ESCRI Conference, London |
| **Respondent B17** | The planning inspectorate |
| **Respondent B18** | The planning inspectorate |
| **Respondent B19** | Cranfield University, Student of Water Management |
| **Respondent B20** | Cranfield University, Principal Research Fellow |
| **Respondent B21** | Cranfield University, Senior Lecturer in Water Resources and Irrigation |
| **Respondent B22** | Cranfield University, Lecturer |
| **Respondent B23** | Anglian River Basin District Liaison Panel, Broads Authority |
| **Respondent B24** | Anglian River Basin District Liaison Panel, Mining and Quarrying Industry |
| **Respondent B25** | Anglian River Basin District Liaison Panel, Anglian Water Services |

| THIRD CYCLE | |
|---|---|
| **INTERVIEWEE** | **ORGANISATION** |
| **Respondent C1** | Landscape Planning & Development Manager , The Parks Trust, Milton Keynes |
| **Respondent C2** | The Scott Wilson Group Ltd, Senior Hydrogeologist |
| **Respondent C3** | The Scott Wilson Group Ltd, Senior Water Specialist |
| **Respondent C4** | Milton Keynes Council, Strategic Environmental Infrastructure Manager |
| **Respondent C5** | Milton Keynes Council, Development Plans Manager |
| **Respondent C6** | English Partnership, The National Regeneration Agency, Milton Keynes Partnership, Assistant Director – Strategic Planning |
| **Respondent C7** | Anglian Water Services Limited, Growth Planning Project Manager |
| **Respondent C8** | Environment Agency, Sustainable Development Account Manager (Anglian Central) |
| **Respondent C9** | Internal Drainage Board, The Bedford Group of Drainage Boards, IDB Bedford Group Engineer |

# APPENDIX E: Interview Guide: First stage

The semi-structured interviews of first stage of data collection relied on interview guide. The broad interview guide questions were made according to the research questions outlined in Chapter 1. Design was flexible.

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|---|---|
| Date of the interview: | |
| Organisation: | |
| Representative: | |


| | |
|---|---|
| *Interviewer:* | |
| *Rozalija Cvejić* | *Supervisors:* |
| *Msc by Research* | *Prof Sue White* |
| *Natural Resources Department* | *Dr. Matthew Cook* |
| *School of Applied Sciences* | |
| *Cranfield University* | |


| | |
|---|---|
| **Part one: Exploring and defining specific contribution and weight of each stakeholder in the overall conceptual framework of Milton Keynes Water Cycle Strategy study (MK WCS).** | |
| 1. | What is the overall aim of your organisation? |
| 2. | Could you list the research questions that MK WCS study covers? Could you please specify the involvement of your organisation in preparation of the MK WCS? What is your system of interest or "stake"? |
| 3. | What are the key areas of the MK WCS study that your organisation covers within this process? What is the organisation's contribution to the MK WCS? |
| 4. | What is the **degree of interest** that your organisation has in the specific research questions covered within the MK WCS study. What is the degree of **influence or power** that your organisation has over the specific questions (all the research questions) within the MK WCS study? |
| 5. | Who are the other stakeholders involved in the preparation of the MK WCS study. What does their involvement present to your organisation? What is the specific involvement of other organisations in preparation of the MK WCS study in your opinion? |
| 6. | Are interests of your organisation in contrast to the interest of the other key-stakeholders involved? Where would you say there is a conflict of interest in the MK WCS study? Where are the interests of your organisation and others mutual in the MK WCS? |
| 7. | Does MK WCS study, in your opinion, cover all relevant questions concerning the water environment? If not, what are the missing issues? Are there any additional issues that MK WCS study should cover in your opinion? What are those and are they being promoted by your organisation within the MK WCS? |
| 8. | What is the workload input of your organisation to the MK WCS study and who do you report to? |
| 9. | What emphasis (priority) is given to which research issue within the MK WCS study? Which evidence supports which MK WCS study research question? |
| 10. | What importance does your organisation place on monitoring? What do you monitor? What |

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|---|---|
| | importance does your organisation place on collecting evidence in general and on collecting evidence supporting the MK WCS study? |
| 11. | What indicators does you organisation use in monitoring the influence of urban sprawl? Which indicators have priority in your organisation and how do they relate to the MK WCS study? |
| 12. | What did your monitoring reveal so far and what do the findings tell you in respect to the Mk WCS study and future development? |
| 13. | Is the quality of evidence taken into account in the process of MK WSC study and what influence does it have? What influences the decision making process if the evidence absent, inconsistent or inconclusive? |
| **Part two: Defining direct and indirect involvement of the Water Framework Directive (WFD) in the MK WCS.** | |
| 1. | What importance does your organisation place on the WFD in preparing the MK WCS study? |
| 2. | What role (if any) (positive or negative) does MK WCS study play in meeting the objectives of the WFD? |
| 3. | Is there any risk of failing to meet the objectives of the WFD? How big is that risk and how does it influence the extent and type of MK growth development? |
| 4. | What would you say the attitude of your organisation is to different water management issues within the MK WCS? |
| 5. | How does the WFD affect the organisation indirectly/directly and in what way? |
| | |
| 6. | Does your organisation cover any cost in the further urban development of MK and what is the direct share linked to the WFD? |
| 7. | Taking into account the size of the growth area that MK WCS covers, how related is it really to the River Basin Management Plan (RBMP) (more than it looks like, less than it looks like…). |
| 8. | Does the absence of RBMP for Anglian River Basing District have any impact on preparation of MK WCS and decision making within the MK WCS? |
| **Part three: Exploring and identifying the current extent of evidence use in [UK's] spatial planning process – focusing on the stakeholders perceptions of quality of evidence that feeds into WCS studies, on the case study of MK WCS.** | |
| 1. | Where is the evidence for each section of the WCS sourced from? |
| 2. | What type of evidence does your organisation provide in the preparation of the MK WCS? |
| 3. | Is evidence your organisation provides for the MK WCS study satisfactory or does it need further interpretation. What kind of interpretation does it need? Who does the interpretation? |
| 4. | What attributes would you assign to the quality of evidence that you provide to the MK WCS study? What is seen as **good quality evidence** in relation to the WFD within the MK WCS and its research questions? |
| 5. | Is the quality of evidence taken into account in the process of MK WSC study and what influence does it have? What influences the decision making process if the evidence is absent, inconsistent or inconclusive? |
| 6. | Does the fact that the MK WCS study is a polycentric cross-sectoral study makes decision making harder or easier? Do you find the multiple stakeholding process within the MK WCS study useful or does it make decision making cumbersome? |

# APPENDIX F: Interview Guide: Second Stage: Academic Researchers

| No. | QUESTION |
|---|---|
| **1.** | What is your field of academic interest? |
| **2.** | How connected would you say your academic activities are with the WFD or any of its daughter directives? |
| **3.** | How connected would you say your academic activities are with the policy making system in the UK? |
| **4.** | How connected would you say your academic activities are with the spatial planning process in the UK? |
| **5.** | WFD looks good as a directive. Considering the history and evolution of water management in the UK how would you say the WFD is any different to the system that was there before? What difference does it bring into the system in respect to:<br>• Decision making, stakeholder involvement<br>• Spatial planning<br>• Quality of evidence in use |
| **6.** | What is your general opinion about the way how the WFD is being implemented in the UK? Who are the key players in implementation and what is your experience in working with them? |
| **7.** | Did you so far observe any changes in relation to importance of different stakeholders (one opposed to another) in the process of decision making in spatial planning/water management? |
| **8.** | How do you think the quality of evidence changes with the process of decision making, such as under the WCS study process? |
| **9.** | What do you think sufficient evidence base is and how would you describe a notion of evidence quality? |
| **10.** | Do the WFD and its daughter directives help in improving the quality of evidence base? If yes, in what way? If no, why not? |
| **11.** | What do you expect from the first WFD implementation cycle? |
| **12.** | How do you think water management is being changed in the fields of:<br>• groundwater management<br>• surface water management (quality and quantity)<br>• flood control<br>• demand management |
| **13.** | Literature defines reformed spatial planning [in the UK] to have a great potential in implementing the WFD? What is your opinion about it? |
| **14.** | Recently, a great emphasis on soundness of the local development plans was made. Planning documents under the reformed spatial planning process have to be based upon a robust and credible evidence base. What do you understand under those words and what is you opinion on quality of currently available evidence (base) in respect to the water |

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| | management issues (water availability, hydromorphological status, impacts of water abstraction, etc). |
| **15.** | Where would you say the major gaps in the evidence base exist at the moment and what influence on implementing the WFD do they have? |
| **16.** | Recent attempts of combining the questions of urban growth and water management can be seen through the Water Cycle Strategy studies, e.g. Corby Water Cycle Strategy, Milton Keynes WCS. If you would take a case of growing city what would be the water management issues you would see as necessary to tackle. |
| **17.** | What methodologies would you use in assessing the impact of the growing city and its demand for additional space and additional water resources? |
| **18.** | The way how the WCS studies are set is that they look at the:<br>• licensed systems for abstraction from reservoirs, rivers and aquifers;<br>• new storage provision (e.g reservoirs) and long distance movement of water between catchments;<br>• raw water abstraction and treatment;<br>• major transfer pumping stations and pipelines to local areas of demand;<br>• local water supply distribution infrastructure;<br>• additional infrastructure to control surface water runoff in urban areas;<br>• local drainage and storage infrastructure;<br>• wastewater network and treatment;<br>• the receiving watercourses (quality, influence).<br><br>From your experience, how well informed would you say the decisions under these research questions are in practice? |

# APPENDIX G: Interview Guide: Second Stage: Planning Inspectorate

| No. | QUESTION |
|---|---|
| 1. | Inspector, tell me what does the planning inspectorate do in this country. What is its history and how is its importance changing. |
| 2. | Reformed spatial planning systems looks good as an idea. Considering the history and evolution of spatial planning in the UK how would you say the process is any different to the system that was there before? What difference does it bring into the system? |
| 3. | What do you personally thing about the new system then. In theory there is a difference, how do you feel it, is the new planning system better, worse, does it bring significant practical changes. |
| 4. | What is your general opinion about the way how the evidence-based spatial planning is evolving in the UK? Who are the key players on the local government level and what is your experience in working with them? |
| 5. | What kind of changes can you make? |
| 6. | When you examine the LDF or a plan, how deep can you go in the evidence base? For example, if we stick to the SFRA. How do you treat it? Is SFRA evidence on its own and you treating it like that, or can you go deeper into the SFRA and look at how it was done, where are the uncertainties within, judge the evidence used for it … Who decides what is the sufficient amount of evidence examined? |
| 7. | How many inspections do you do per council, county – per local authority? |
| 8. | What about public consultation? Where does this come along in the process? I have the feeling it comes in quite late in the process. In my case, the thing I'm focusing on is the preparation of the WCS study, it comes … it's the last thing you do. WFD is very keen on public consultation …not only the key-stakeholders, where do you think the consultation should happen, what is your opinion about it? |
| 9. | Is there a room for them public to change the evidence, make it different, more precise, as in case of the sites of flooding … |
| 10. | How do you think the quality of evidence changes through the process of producing the LDFs. Does the base evidence change? |
| 11. | So what do you think about for example climate change and the evidence to support that. There's still allot of debate about it, there's still allot of debate on that … it's in SFRA, in the WFD … and the evidence is still debatable. |
| 12. | Is that part of forward looking policy making? |
| 13. | Another thing I would like to ask you is how you cooperate with the representative of the local governments, councils, other key-players in general. What is your experience? What about these key-players ad stakeholders? |
| 14. | Do you think there's enough time after the independent examination for key-players to collect enough evidence to object a part of the plan, give the fact that the previous process of preparing a technical document was somewhat a closed process? |
| 15. | Some people at the council say the new evidence based-planning system demands much more |

| | |
|---|---|
| | of evidence gathering than previous system. |
| 16. | Do you especially hand this document to the councils? I know they're available on your web page. |
| 17. | What sort of gaps in evidence are you encountering? |
| 18. | Do you have any more complex examples? Because this is something I wouldn't expect to happen anymore - allocating without SFRA. Something that's not so obvious, not so easily detectable. |
| 19. | Is the new planning system improving the quality of evidence? |
| 20. | Who decides when is the evidence base sufficient. Is it the combination of experience and lets say a belief that for instance EA is doing their job as they should. |

# APPENDIX H: Questionnaire: Second Stage: Anglian RBD Liaison Panel

| No. | QUESTION |
|---|---|
| 1. | What does your organisation do in the ARBDL Panel? |
| 2. | What would you say the benefits of being in the ARBDL Panel are for your organisation? |
| 3. | Please describe the function and importance of your organisation in respect to local spatial planning process. |
| 4. | Please describe the function and importance of your organisation in respect to the implementation of the WFD. |
| 5. | Do you get involved in the WCS process? Please describe the function and importance of your organisation in respect to the WCS Process. |
| 6. | Has your role in local spatial planning process changed since you became a part of the ARBDL Panel? Please explain. |
| 7. | What is the importance of the WCS process in the implementation of the WFD through the RBMP? |
| 8. | What opportunities does the WCS process present to the implementation of the WFD under in your opinion? How are those being addressed in practice? |
| 9. | How should WCS studies and the Anglian RBMP integrate in the future (spatial and temporal integration)? |
| 10. | Do you agree with conceptual framework under WCS? Is there any additional research question that should be covered and are not at the moment? |
| 11. | How important is the multiple-stakeholding process for the quality of evidence base that feeds from WCS into the Local Development Framework? |
| 12. | What benefits does the WCS process generate for the quality of the Anglian RBMP that is being prepared? |
| 13. | What would you say about the way how the WFD is being addressed in the WCS process? Is it sufficiently addressed? |
| 14. | Feel free to and any comments. |

# APPENDIX I: Questionnaire: Third Stage: MK WCS Steering Group

| **PART ONE: Stakeholder functions.** |
|---|

| **1.** | **Do you consider your organisation as a vital part of the MK WCS study Steering Group?** | | |
|---|---|---|---|
| | Yes | Why? | |
| | No | Why not? | |
| **2.** | **Do you feel you have contributed to the MK WCS study Stage 1 substantially?** | | |
| | Yes | How? | |
| | No | Explain. | |

| **3.** | **Has your role in spatial planning changed since you became a part of the MK WCS study Steering Group?** |
|---|---|
| **A** | Yes, substantially. We are becoming a very important part of decision making in spatial planning process. That was not the case in the past. |
| **B** | Moderately, because we have always been around and had the same function. |
| **C** | Slightly. We've been included in the decision making process before, however this time we got more involved. |
| **D** | Not at all. The function of us a stakeholder remained the same, we are as equally important as we were before. |

Comment if you like here:

| **4.** | **Describe how the role of your organisation changed during the MK WCS study? (Even if it changed just slightly)** |
|---|---|

| **5.** | **Do you think the role of your organisation within the MK WCS study process should be more explicit in the future?** | | |
|---|---|---|---|
| | No | Explain. | |
| | Yes | Describe. | |

| **6.** | **Which research questions received the most of your attention within the MK WCS study?**<br>**Rank the significance of each research question and add new to the list if needed.**<br>**Ranking: 1 –** hardly any attention**, 2 –** moderate attention**, 3 –** full attention | |
|---|---|---|
| **Rank** | | |
| **A** | | Water and waste water treatment issues |
| **B** | | Drainage and flood risk management |
| **C** | | Strategic delivery of water resources |
| **D** | | Economic instruments for managing water demand |
| **E** | | Other instruments managing water demand |

| | | |
|---|---|---|
| **F** | | Green infrastructure |
| **G** | | Sustainability appraisal |

Please feel free to comment below. Add new rows (both above and below) if needed.

**PART TWO: Relation between the implementation of the WFD and the activities of the stakeholder within the MK WCS study.**

| **7.** | **What importance does your organisation place over the implementation of the WFD?** |
|---|---|
| **A** | Little so far. However the MK WCS study changed our opinion in respect to how we could be involved the implementation more actively (e.g. education opportunities). |
| **B** | Implementation of the WFD is not in our main plan. There are other institutions in charge and we rely on those. |
| **C** | Our organisation places questions under the WFD on its top priority plan. |
| **D** | The WFD is a new way of thinking. We are actively undergoing a process of implementation. |

| **8.** | **What is the importance of the MK WCS study in the implementation of the WFD?** |
|---|---|
| **A** | The MK WCS study is a small scale plan and WFD is much too broad to relate to the strategy. |
| **B** | The MK WCS study should not be used without the RBMP. |
| **C** | The MK WCS study is a crucial document that should feed into the upcoming Anglian Rver Basin Management Plan. |
| **D** | The MK WCS will make the Anglian RBMP sound. |

Please feel free to comment below. Add new rows (both above and below) if needed.

| **9.** | **What activities that you provide as a stakeholder in the MK WCS study are related to or directly affect the implementation of the WFD?** |
|---|---|
| **A** | Implementing standards of daughter directives though a study. |
| **B** | Informing other stakeholders about the WFD, partnership approach and integrated planning. |
| **C** | Indirect effect through creating an institutional landscape for the provision of sustainable dvelopment. |

**Other:**

**10. What opportunity presents the WFD under the MK WCS study in your opinion?**

**Please write few points below.**

| | |
|---|---|
| **A** | |
| **B** | |
| **C** | |
| **D** | |

**11. Is your post as a stakeholder changing in a way that helps to implement WFD more**

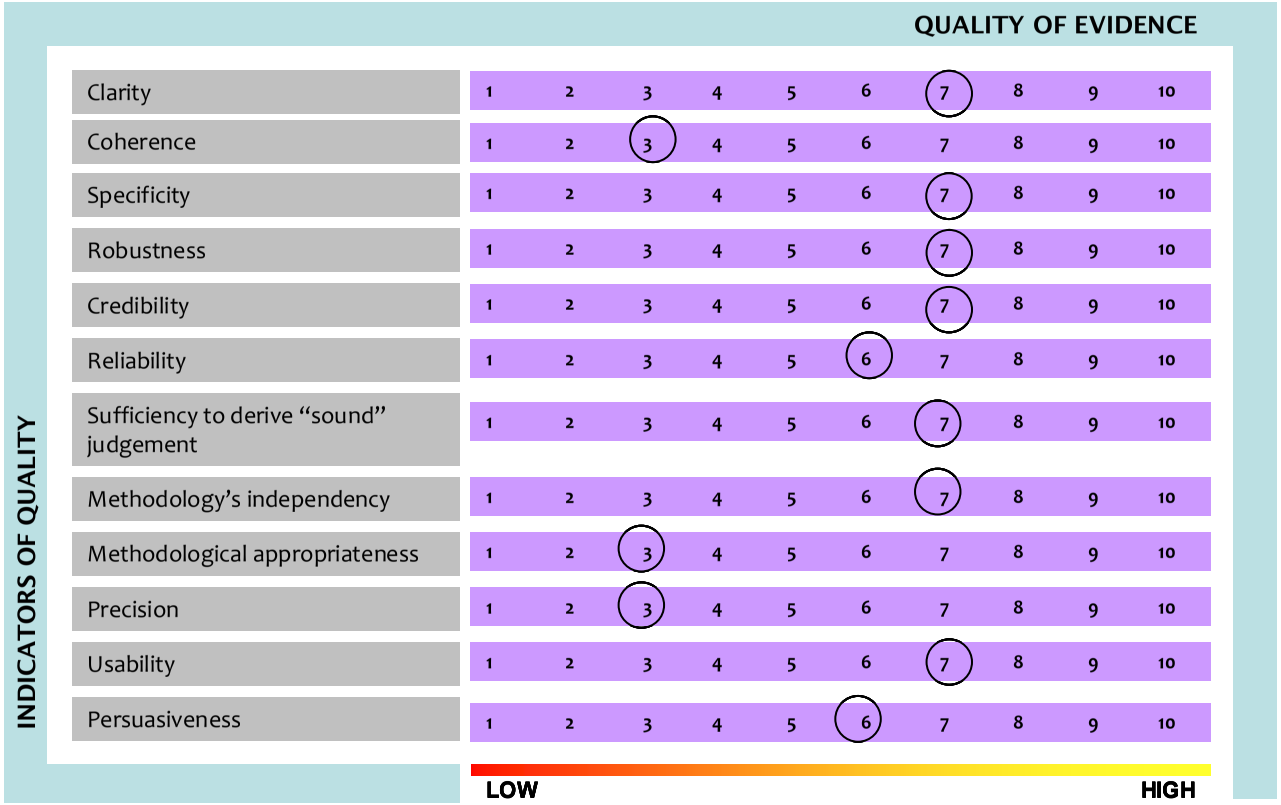
| | |
|---|---|
| | **actively?** |
| **Explain:** | |
| **12.** | **How should MK WCS strategy and the Anglian RBMP integrate in the future?** |
| **A** | The WCS should be called the **Urban WCS**, because it focuses on urban water demand and environmental impact on water environment from urban activities. |
| **B** | The WFD expands the MK WCS and gives reason for a holistic approach. All impacts on water environment should be considered already in the Detailed stage of WCS |
| **C** | The WFD expands the MK WCS and gives reason for a holistic approach. All impacts on water environment should be considered already in the Detailed stage of WCS |
| **Other:** | |
| **PART THREE: Quality of evidence in evidence-based spatial planning: the MK WCS study in relation to the WFD.** | |

| | |
|---|---|
| **13.** | **Do you agree with the methodology undertaken in the MK WCS study? How would you improve it?** |
| **14.** | **How did the multiple-stakeholding process improved evidence base and the interpretation of data that was available?** |
| **A** | Generally the consultants covered the relevant questions and only slight changes had to be made to different research areas. |
| **B** | Generally the consultants covered the relevant questions and only slight changes had to be made to different research areas. It's where our function got more explicit because of our technical background. |
| **C** | Generally the consultants covered the relevant questions and only slight changes had to be made to different research areas. It's where our function got more explicit because of our local knowledge. |
| **D** | Generally the consultants covered the relevant questions and only slight changes had to be made to different research areas. However, most of the time the research questions were too technical for us to comment on. |
| **E** | Other: |
| Please comment. | |
| **15.** | **What is the new feature of evidence in use after you have influenced it?** |
| **16.** | **What changes do the new feature bring to the MK WCS study overall?** |
| **A** | None. The questions are too technical. We are interested in how it changes our activity at the end. |
| **B** | Moderate. |
| **C** | Drastic. We question some of the assumptions that change the MK WCS drastically. |
| Comment below if you wish to make a live example (very welcome). | |
| **17.** | **Did the process of the MK WCS study give you a better insight into quality of your evidence base?**<br>**What did it tell you about the evidence quality in respect to its:** |

| | ROBUSTNESS \| SUFFICIENCY TO DERIVE SOUND JUDGEMENT \| PRECISION \| AVAILABILITY |
|---|---|
| **18.** | **How did these descriptors change during the process of the MK WCS?** |
| **19.** | **What did it tell you about strengths of your methodology?** |
| **20.** | **Did it encourage you to bring changes to your monitoring system in order to make it more fit for purpose?** |

# APPENDIX J: Evidence Quality Evaluation Matrix

**EXAMPLE of evidence quality evaluation:** Evaluating **maintenance and landscaping around the water features.**




**Space for comments**

*"The thing I wanted to capture there, going through is that because of our experience in the practicalities in managing areas of water and the areas of landscape around water; we would be clear, specific, credible, you know because of the experience. We have and evidence base, we know how much things cost, time, approaches that are appropriate and all the rest of it. But in terms of coherence, and methodology we haven't done that for specific evidence gathering reason. It's what we do, it's not something we record, sort of publish, and you know shout about as such, in that way…if somebody would come to us and say, for part of WCS we would like to know how you manage water and these areas of land with water courses through them we cannot just say "Oh here, read this" – it's not a coherent thing recorded. What I'm trying to get across here, three is not methodology behind, and the way we recorded the evidence."*